THE TRADE REVIEW

AND WESTERN MACHINIST.

WEEKLY EDITION, Vol. XVI—No. 39. } CLEVELAND, O., SEPTEMBER 29, 1883. { MONTHLY EDITION Vol. I.—No. 10.

Pumping Engines on a New Principle.

As pertinent to a recent article on "High Rates of Duty in Pumping Engines," we give, in this issue, a series of views and diagrams of much interest to mechanical engineers, descriptive of a comparatively new type of pumping engine, designed by Mr. E. H. Martin, the well known engineer of the Cleveland Rolling Mill Co. It will be remembered that in the article referred to, the principle was laid down that, in order to obtain the highest duty, the following conditions must be complied with: 1st. Higher ratios of expansions. 2d. Higher rates of piston speed. 3d. The reduction of clearances to a minimum. It was shown that in these three respects the ordinary types of direct-acting engines are deficient, chiefly because they cannot get greater piston speed in the steam cylinders without increasing the speed of the water piston to a dangerous degree. To

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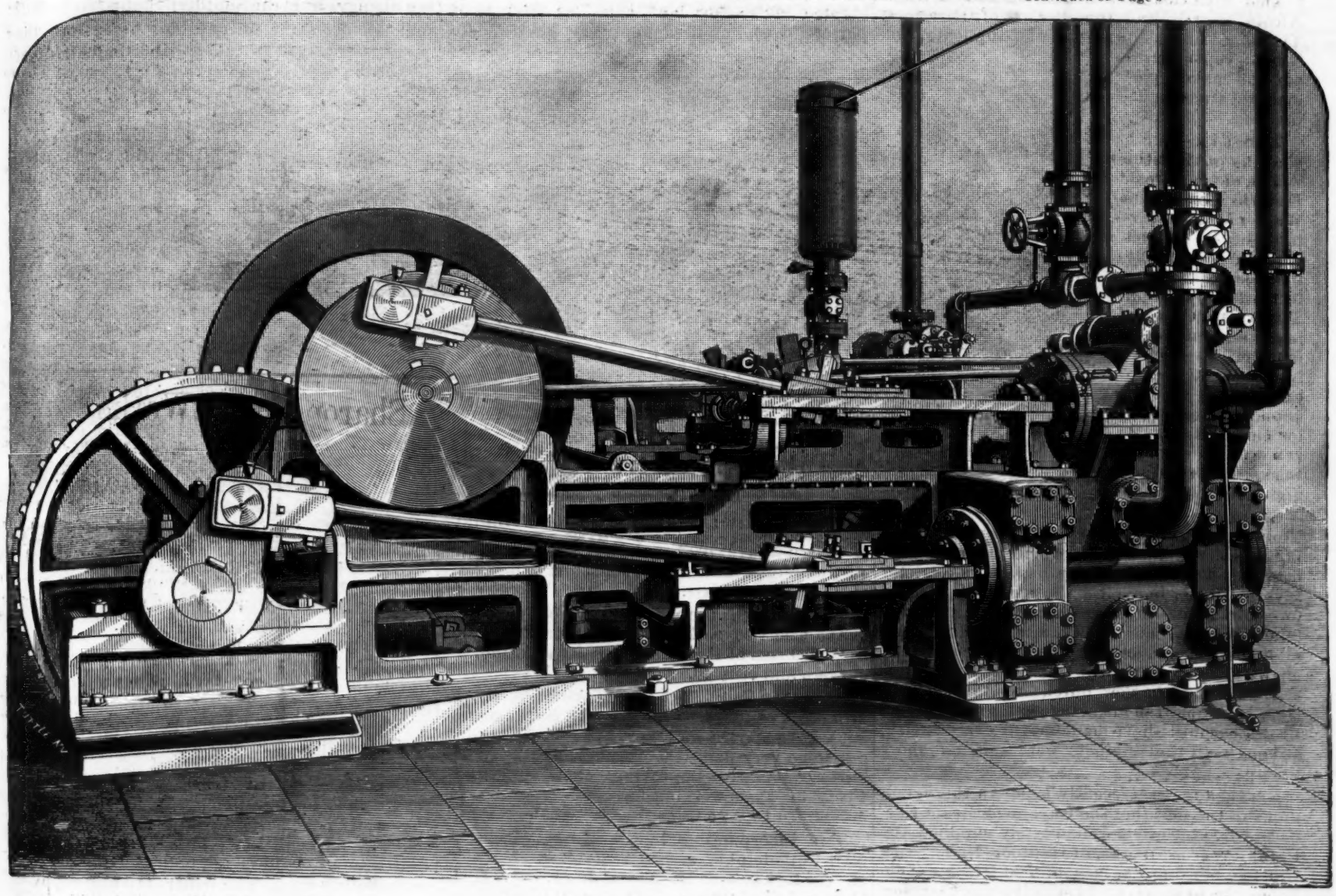
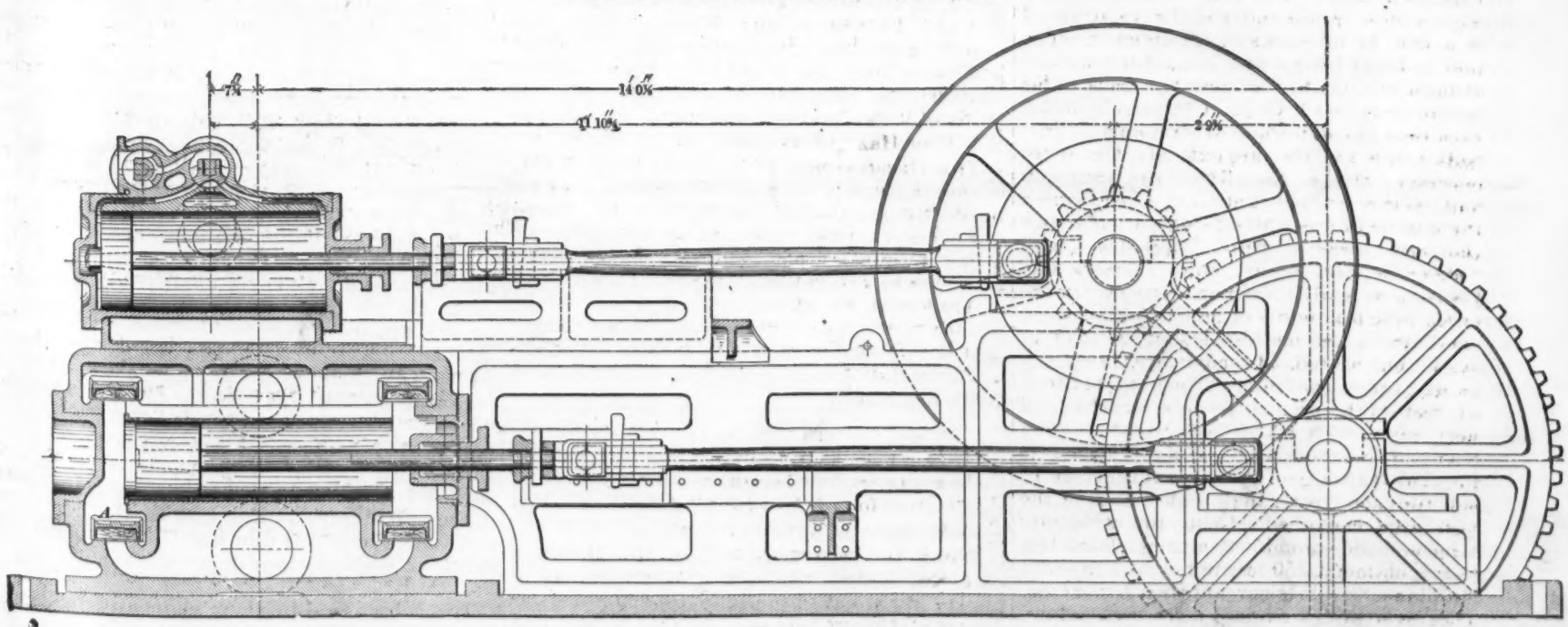


MARTIN'S NEW DOUBLE PUMPING ENGINE.



Long. Section on Centre line of Cylinders.

FIG. 1.

Manufactures.

CLEVELAND.

THE Cleveland Co-operative Stove Co.'s St. Louis branch has started up with 50 men so as to meet numerous fall orders.

A VISIT to the Worden Tool Co.'s works, on Leonard street, shows that 20 hands are now employed in turning out chopping axes, double bitted axes, broad axes, hatchets, drawing knives, coopers' tools and other edge tool specialties. The works have been established seven years, and Mr. C. Worden, the manager, has had 30 years' experience in the business. Trade is very fair.

THE Standard Lighting Co. have opened a main office at 122 Water street. Z. Davis is President, W. B. Blake, Vice President, and F. L. Alcott, Secretary and Treasurer, these gentlemen with George Worthington and Leverett Alcott constituting the Board of Directors. They are the sole owners of the duplicate system of vapor burners, and make a specialty of street lighting.

THE six-inch shafting put into the works of the Brush Electric Co by the Walker Manufacturing Co., is 45 feet long, yet so nicely balanced that it can be turned by hand. The Walker Co. have lately booked orders for very large gearing for Western concerns and a 16,000-pound engine wheel for an engine establishment. The works are running night and day.

OF an important Youngstown project which a Cleveland syndicate will no doubt soon begin to operate, the Youngstown News-Register says: Brown, Bonnell & Co. are taking orders for delivery on or before October 1, and have taken none beyond that time, as it is expected all arrangements looking to a settlement of the affairs of the concern will be adjusted soon after that date and the new purchasers take possession. Under the management of Receiver Brown the mills have made money every month, although all the products were sold on short time.

REFERENCE was recently made in these columns of the fact that the Cuyahoga Steam Furnace Co., of Cleveland, had lately supplied the Franklin Iron Works, of Clinton, N. Y., with two fine blowing engines of 500 H. P. each. Referring to these works, the Boston Commercial Bulletin says: The process of starting a blast in a large iron foundry is always attended with a deal of interest and excitement. The Franklin Iron Works are located about one mile south of Clinton, very near the track of the Delaware & Hudson Canal Company's Road. In the towns of Clinton and Westmoreland, surrounding these works, are extensive iron ore beds which are the properity of the company operating the works. The last blast, which had continued incessantly for three years and thr e months, was "blown out" last March, and the new furnace, with improvements, was "blown in" a few days since. Inside of the furnaces were nine cords of four feet hard wood at the bottom, and on top of that 25 tons of coke, 40 tons of coal, 53 tons of ore, 17 tons of stone, and two tons of cinders, making 147 tons in all, besides the wood. The old furnace was 54 feet high, with a 14 feet "bosh." The new one is 75 feet high and has the same size bosh. The capacity of the new furnace is 75 tons per day, or greater than that of both of the old furnaces combined. Other improvements have been made, prominent among which is a large new chimney, 150 feet in height and seven feet in diameter. It is covered with boiler iron. Two new Cuyahoga engines have been set up. They were built in Cleveland, O., and their capacity is 500-horse power each. The Franklin Iron Works Company give employment to a very laage number of people.

OHIO.

THE Arnold Furnace, Niles, blew in last week.

WELLSTON Furnace, at Wellston, O., is in blast, making 22 tons a day.

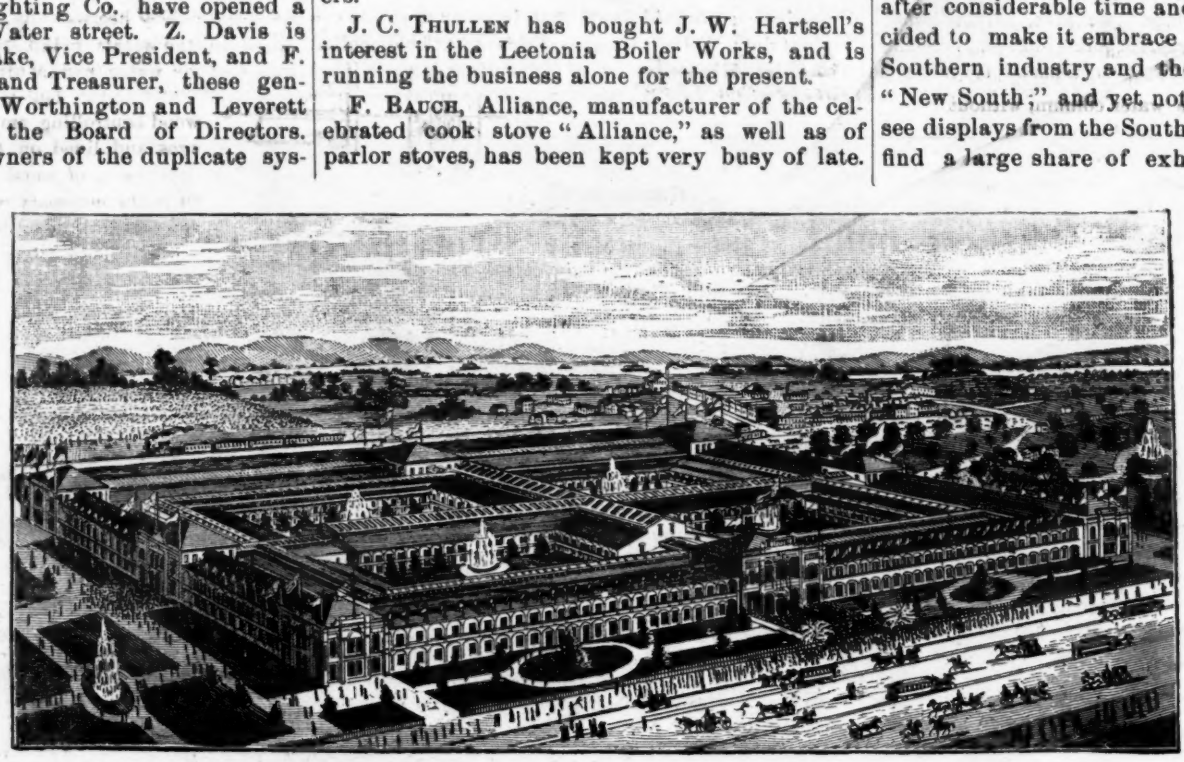
SIXTY pumps per day is the present output of the Superior Manufacturing Co., New Carlisle.

THE Champion Works, at Springfield, are about to build a new cupola of 30 tons capacity.

F. & L. KAHN & BROS., Ironton, are making 800 to 1,000 stoves a week, employing 80 moulders.

J. C. THULLEN has bought J. W. Hartsell's interest in the Leetonia Boiler Works, and is running the business alone for the present.

F. BAUCH, Alliance, manufacturer of the celebrated cook stove "Alliance," as well as of parlor stoves, has been kept very busy of late.



THE LOUISVILLE, KY., EXPOSITION BUILDINGS.

His works have been running six years and employ eight men. Mr. Bauch is a practical mechanic himself.

WE learn that the Akron Iron Co. have within the past two weeks received orders for 15,000 to 20,000 sets of their hot polished shafting, for mowers and reapers.

SINCE the Solid Steel Co., of Alliance, (T. R. Morgan, President, C. W. Roepper, Superintendent), have started up, they have been turning out some very fine steel castings, and they are still constantly improving their processes. From 30, their working force will soon be increased to 100, we learn.

THE incorporators of the Goshen Iron Co., New Philadelphia, are A. T. Raiff, F. C. Miller, H. T. Stockwell, I. H. Kurtz, John Parr, H. L. Custer, Joseph Welty, J. H. Booth, Wm. Sharp, and J. H. Bamhill. The capital stock is $300,000, and Pittsburgh and Warren parties are said to have taken considerable of it. The object is to buy the Ward interest in the New Philadelphia rolling mill and carry out the terms of the original contract. Mr. James Ward is spoken of as manager.

THE Hazelton mill of Andrews Bros. & Co., is running steady with excellent prospects for its continuance.—The rolling mill at Girard did not get started this week as was expected, owing to repairs not being completed.—The assignees of James Ward are paying a dividend of 1 per cent. out of the assets of his first failure ten years ago. The assets of the second failure will hardly amount to enough to declare a dividend of even 1 per cent.—[Youngstown News-Register.

IN GENERAL.

UPON a recent visit to the Volta Galvanizing Co.'s works, at Pittsburgh, a representative of this journal found them running night and day. Trade is fair, but prices are low.

WHEN the new steel mill of the Hartman Steel Co., Beaver Falls, Pa., is entirely completed, it will have a capacity of 200 tons per day of steel wire rods and finished wire. The works are now running to the full satisfaction of the company.

SEVEN ACRES OF MACHINERY.

LOUISVILLE'S EXHIBIT OF MODERN APPLIANCES.

Salient Features of the Greatest Southern Exposition.

SPECIAL CORRESPONDENCE.

LOUISVILLE, Ky., Sept. 20.—At last the great Southern Exposition is under full headway, it being just fifty days since the large engines put all the machinery in motion. This Exposition was organized by the people of Louisville, who subscribed nearly $300,000 to put the mammoth enterprise on its feet. At first it was proposed to make it entirely a cotton exhibition, but after considerable time and thought it was decided to make it embrace all that pertained to Southern industry and the development of the "New South;" and yet not only does the visitor see displays from the Southern States but he will find a large share of exhibits here from the great industries of the East, North aud West; so that it can truly be said, that the Exposition is of a national character.

The main building is 900 by 600 feet, and covers 13 acres of ground. The annexes are all very large, the sawmill annex being 400x75 feet and that for carriages and wagons 250x100 ft. The Art Gallery is located in the Park at the north end of the main building, and the experimental gardens at the extreme south end.

The electric light display is indeed wonderful. The main building and Art Gallery are lighted with 4,600 Edison incandescent lights of 16-candle power each. The courts with 75 arc lights, are lighted with the Jenney arc light of 2,000 candle power. The U. S. Electric Light Co. have an elegant display of arc and incandescent lights.

The Machinery Department of this Exposition is considered the most important feature. The space occupied by this department is a little less than half of the ground floor of the main building, equaling about seven acres for the machinery division alone. Some idea may be had of the display when it is known that to run the several engines requires steam boiler capacity of 1,500 horse-power. This requires seven batteries of boilers equal to four large boilers each. The boilers are also supplied with four "Worthington" duplex speed pumps, two "Royce" steam pumps and one "Doctor" steam pump. These boilers are located on the south side of the main building under the boiler houses 130 feet long by 70 feet wide. To operate this extensive machinery nine engines of the latest improved pattern are needed. There are now in operation one Reynolds Corliss engine 600 H. P., one Porter Allen 275 H. P., one "Cummer" 130 H. P., one Harris-Corliss 200 H. P., one Taylor 100 H. P., one Westinghouse 100 H. P., three Armington & Simms 400 H. P. and one Buckeye 100 H. P. The Reynolds Corliss and Armington & Simms engines are used to drive the electric light machinery, the others for the exhibits.

There are about 2,400 feet of main shafting used. Of this the Akron Iron Co., of Akron, O., furnish about 1,000 feet of their celebrated "Hot Polished Shafting." The machinery department is well represented and further mention will be made of the most prominent exhibits later on. Mr. E. Benjamin has general charge of the Machinery and Engineering Departments and much credit is due him for his untiring efforts in making these departments what they are.

It has been said by those eminently qualified to speak, that the paintings in the Art Gallery

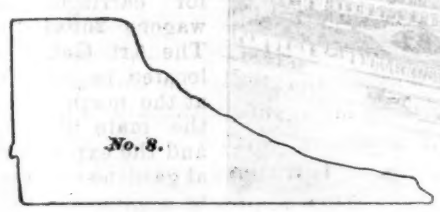
Continued on page 6.

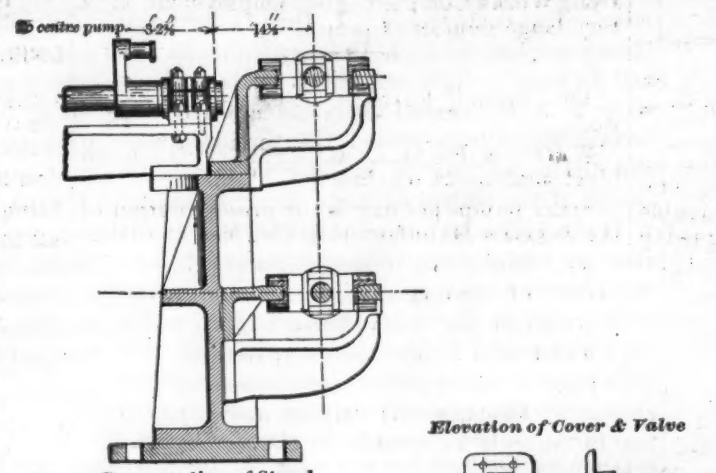
Continued from Page 1.

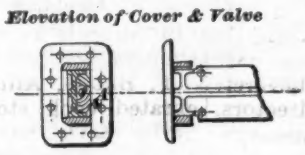
remedy these defects Mr. Martin designed the compound engine herewith illustrated, the characteristic feature of which is that the expansion and speed can be carried to any extent consistent with proper maintenance, at the same time imparting a reasonably high pump piston speed and a smooth, even motion to the water column.

In the accompanying engravings (pages 1 and 3) is represented a pump designed for city water works, or for any service where large quantities of water are required to be pumped either under ordinary or exceptionally high pressure, the object contemplated being the providing for high steam piston speed and a fair grade of expansion, together with such action as will permit reasonably high pump piston speed, and at the same time bring about a smooth motion of the water column, without destructive shocks to the machinery.

Referring to the engravings, Fig. 1 represents a longitudinal section, and Figs. 2 and 3 represent respectively a plan or top view, and cross sections at different points, together with







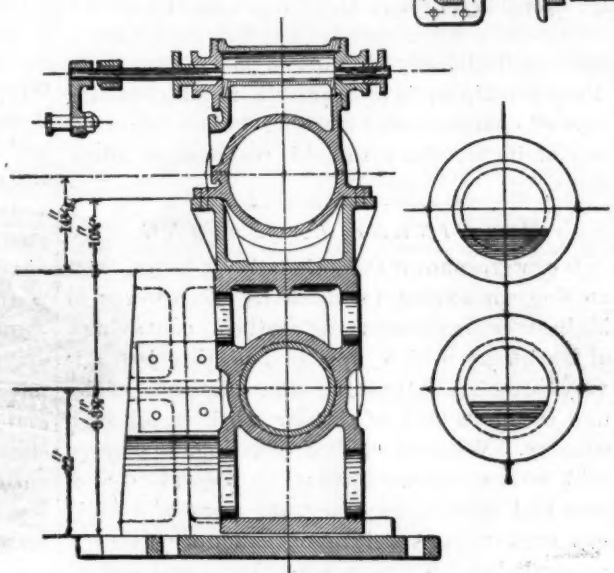
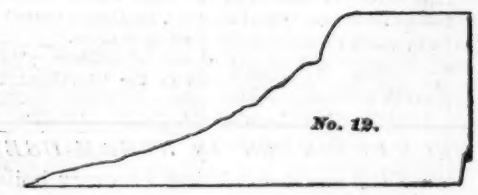


FIG. 3.

which, however, from the combined operation of comparatively high rotative speed, the equalizing effect of the momentum of reciprocating parts at high speed, and the effect of coupled engines, with the resulting regular motion, may be considerably higher than ordinarily found advisable. Thus in the pumps here illustrated, we are informed that 550 feet steam piston speed, with 160 feet piston speed in the water cylinder, is frequently used, the water pistons working against a pressure of 450 pounds per square inch, corresponding to a head of about 1,000 feet, and that under this high speed and pressure the valves lift and close so easily as not to be heard.

The steam valves, both main and cut-off, are rotary valves, and are driven from eccentrics on the crank shaft. The pump valves, as shown in the engraving, are simple blocks of wood controlling ample and direct water passages, and lined on the top and sides with a thin casing of metal for the purpose of giving them the necessary weight, and also to prevent wearing in the guides between which they work. These valves are found, in use, to give



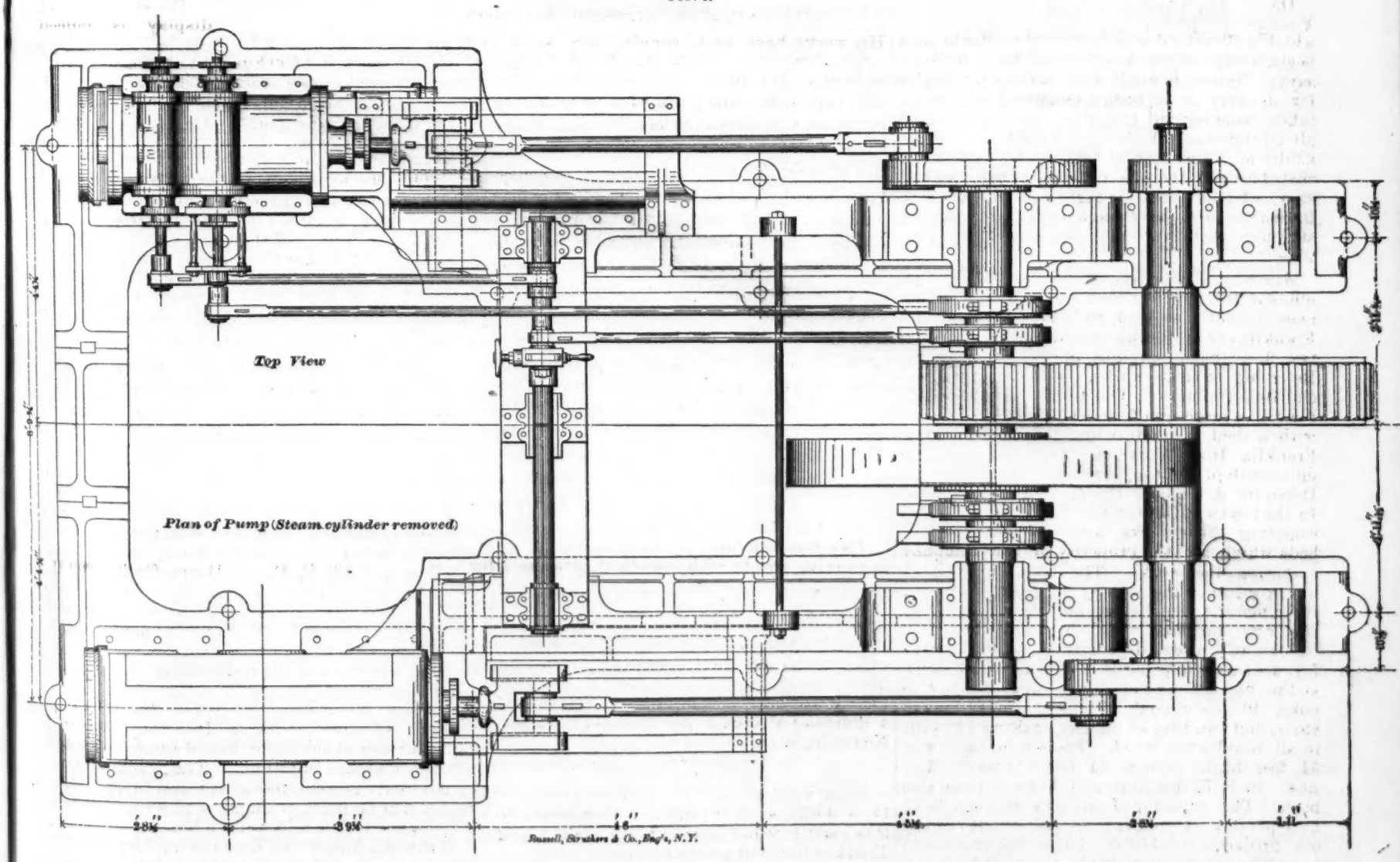


FIG. 2.

other detail. It will be seen that there are two steam cylinders, connected to cranks at right angles on a shaft carrying a fly-wheel and a pinion. The pinion gears into a spur wheel on a second shaft, below and back of the main crank shaft, the second shaft being fitted with cranks for connecting to the two water cylinders, situated immediately below the steam cylinders. By this means the steam pistons may be moved at a high rate of speed, while the speed of the water pistons is no greater than is found to be unobjectionable, entire satisfaction, a set of them made from soft maple wood having been used, in one instance, day and night, for five years with no signs of requiring renewal, which, however, can at any time be done at an expense merely

Concluded on Page 5.

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To Machinists, Manufacturers and Others.

THE publishers of the TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinists and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised before sending to press.

☞ When writing to any of our advertisers, please say that you saw their advertisement in the Cleveland TRADE REVIEW.

RECKLESSNESS IN STEAM-USERS.

Could the exact condition of every boiler in the United States be known, it is scarcely to be doubted that there would be a revolution in the present state of public security on the subject. We would not minify the good work already accomplished by the Government and inspection companies—they have done very much to diminish the hazard—but notwithstanding the most rigid requirements, now and then a terrible explosion occurs which reveals the ugly fact that even these safeguards are as yet insufficient to prevent recklessness and neglect, with their awful consequences. Just now it seems as if these horrors were being heaped one upon another, the climax being reached in the terrible sacrifice of life and property in a Pittsburgh steel-mill, and the attendant fact that through the neglect of the owners there was no record of the exploded boiler in the inspector's office, and consequently no inspection of it whatever. On an ordinary steam tug this would scarcely have been possible, owing to the Government's vigilance; but in a large mill, in a thickly populated part of the city, with no regular engineer in charge, the neglected boiler was allowed to take care of itself, until the inevitable result came.

Slowly the causes of both this and the Riverside disaster are coming to the surface. The Riverside boiler, it appears, was nothing but a shell patched up with soft iron. John Cullum, an old and experienced boiler-maker of Kingston, N. Y., testifies to this fact, and adds to it the startling statement that fully one-half the boilers in New York are in a dangerous condition. Soft iron patches are much cheaper than hard iron, and are put on, forsooth, to save money. "The man," said Mr. Cullum, "who is the cleverest in fixing up these makeshift patches gets the most praise." Sometimes a soft patch is covered with putty and then bolted on to the corroded shell, but, of course, the corrosion goes on. Even wooden plugs have been driven into holes in steamers' boilers when steam was up! What other result is to be expected, even though we admit that these are isolated and exaggerated cases?

A few serious considerations arise from these more recent occurrences: 1. Does Government inspection inspect? 2. Does not the hazard call for equally rigid inspection on land as on water? 3. If licensed engineers are required on even steam tugs, should inexperienced boys and dissipated men be allowed to remain in charge of the boilers of large establishments? 4. Is the hydraulic test an infallible one, and is even the hammer test altogether reliable? 5. Is the effect of opening the throttle and consequent relief of the steam pressure in the boiler fully understood? The theory of Lawton, that such relief of steam pressure produces a sudden expansive shock, seems verified, according to the Pittsburgh *Telegraph*, in the case of the Pittsburgh explosion.

We welcome as friends of humanity all agencies tending to lessen these hazards, and have a particularly warm side for the National Association of Stationary Engineers, one of whose cardinal principles is to require a regular certificate of character and training before allowing any of its members to hold responsible situations.

MACHINERY ENGRAVING.

We were shown the other day a letter from an English expert in which he used words of highest praise concerning certain engravings of machinery which appeared in this journal, very strongly intimating that nothing of the like could be said of similar work in his own country. Without undue boasting, it may be said with exact truth that, in respect to fineness and general accuracy, the work of American engravers, especially of machinery, stands unparalleled. There is a heaviness and lack of lustre, if we may so denominate it, about the cuts which appear in English mechanical journals, that instantly disclose their origin. Yet our own engravers are by no means without their faults. We have before us a piece of rejected work done for a firm in a neighboring city making a specialty of saw mill machinery and high speed engines. Brought in contrast with a photograph, the engraving shows most glaring blunders, of which we mention a few: The crank wheel of the engine, instead of being on a direct line beneath the cylinder, is made to appear at an angle, rendering the working of the crank-rod an impossibility. A tilting-lever, which should work freely, looks as if it were cast solidly into the frame of the carriage. One of the runners of the carriage, which should show a bevel, presents a plane surface in the engraving. The bed-plate of the engine, which in the photograph shows plainly that it is to be bolted to the foundation, shows in the cut no such arrangement. The names of the builders are entirely omitted, both from the engine and the saw mill. A universal joint in the photograph becomes a universal jumble in the cut, and the entire appearance of the engraver's work is rough, unfinished, and forbidding, instead of bright, accurate and attractive, as it should be. The fault was, first, in the lack of knowledge on the part of the engraver as to the relative importance of the various parts of the machinery, and secondly, in his want of even ordinary care in giving it any degree of artistic finish.

The only safe remedy for such defects is, first, to spare no expense to secure the very best work, and secondly, to require proofs and corrections until everything is satisfactory. Most engravers invite this close scrutiny and profit by it. We know of one large company who always require these repeated proofs before they accept such work, and the result is shown in the always attractive appearance of their catalogues. Of course there is such a thing as "touching up" certain parts of a piece of machinery, in engraving, so as to give them more prominence than appears in the photograph, but up to a certain limit this is entirely legitimate and is quite generally practiced. The most modern processes, however, do not admit of such "improvements," the photo-engraving and the artotype presenting very much the appearance of the original photograph. Machinery manufacturers have a strong liking, however, for the new process, and only object to it because of its expensiveness.

LONG WAY AROUND IN MECHANICS.

While it cannot be laid at the door of the average American inventor or mechanic that he lacks facility to make his mechanical processes direct, simple and effective, nevertheless there is a great deal of the roundabout method in reaching results, which cannot be too strongly reprehended. To show what we do *not* refer to, it may be well to advert to the ordinary screw-making machine. Here is a piece of wire of the required diameter; it needs to be cut off to a stated length; the operation is performed instantly, exactly and without ceremony. The next step is to taper it to the desired shape; no waste power or complicated motion is expended in the act. Deft steel fingers seize the embryo screw; it is held with vise-like rigidity until the "paring" stage is gone through with, and then follow with like directness and precision the various other processes, until it comes out bright, finished and ready for the market. Not a single step in manufacture could be eliminated; not a motion of this almost human piece of machinery is frittered away. And so it is with many other approved appliances of to-day.

The inventor or mechanic who lacks this gift of directness, however, is always in sad straits. No sooner does he devise one part to overcome an obstruction, than he is called upon to dovetail in another, to eliminate difficulties which the introduction of the first gives rise to; and so from one roundabout process to another he goes, until he has a complicated piece of mechanism as aimless as it is useless. Illustrative of this "long way around" in mechanical processes we refer to what is claimed by an English inventor to be "an improved form of steam generator for using liquid fuel, such as petroleum," etc. The simple problem before him was: how to burn petroleum under boilers with the closest economy and the best results as to heat. As a first step—great are the uses of economy!—he invents *a new form of boiler*. Here is a fine bid for steam-users to pitch their old-style boilers into the scrap heap and rush with all possible speed to obtain the new one. But his originality does not stop here. Connected with this new and wonderful boiler is a series of furnaces, terminating in a combustion chamber or chambers; and then, as if the first cost of this valuable device were not enough, the flame and gases are made to turn back through side flues to the front, where they enter other combustion chambers, whence by still other tubes they are again conveyed to the back, then by another route to the front, and are then allowed to escape in the chimney. This is in no wise an exaggeration of the very technical description which we have before us, nor does it complete the picture. Space forbids any attempt at a description of the fearful and wonderful construction of the burner. Cones within cones, annular spaces connecting with still other annular spaces, circular discs, cocks, reservoirs and what-not go to make up this mysterious mechanism, and, to cap the climax, a

separate reservoir, fed by a separate pump, (operated by hand until steam is available!) furnishes a current of air which feeds the flame and without which the whole apparatus would doubtless fail even to bake potatoes.

It might surprise the ingenious inventor of this monument of complicated uselessness, as well as the learned mechanical journal which describes it, to learn that a Yankee woman inventor, with identically the same problem before her, accomplishes substantially all the results claimed for the English apparatus by simply feeding crude petroleum into a cast-iron pan, over which she places a perforated iron plate, and this under any kind of a boiler.

Complete and very satisfactory statistics are given by the Mobile (Ala.) *Register* in its annual exhibit of the business of that thriving Southern city. A significant fact brought out is the rapid advancement of Mobile as a coal-receiving and coal-shipping point. From 6,367 tons in 1879 (scarcely more than an average two days' receipts at Cleveland), her receipts climbed up 26,533 tons in 1882—a growth greater than geometical progression. What the city now needs more than anything else is unimpeded navigation to the coal and iron regions of Alabama—a consummation which the *Register* wisely and strongly urges upon its business constituency.

HERE it goes again. In the latest brood of "engineering" specialties we notice the "contracting engineer" and the "manufacturing engineer." Next we will have the genial blacksmith disguised as the "smithing engineer," and then what?

Pumping Engine on a New Principle.

[Concluded from Page 3.]

nominal. Another feature of this construction is, that should any slight repairs or packing be required in either of the steam or water parts that particular part can be disconnected for such repairs or packing while the other can be run independently, thus making an entire stoppage of the water supply almost impossible. A very important consideration in the water supply of cities or large industrial establishments.

The indicator diagrams from steam cylinder were taken from the Cleveland Rolling Mill Co.'s water works pumps, of 4,000,000 gallons capacity, which have been working day and night for over two years without having been opened. The diagrams have been reduced to one-half their original size. The following data are applicable to these diagrams:

Diameter of cylinder,	15 inches.
Stroke of piston,	30 inches.
Revolutions per minute,	62
Boiler pressure,	50 pounds.
Indicator spring,	20
Pressure in water cylinder,	160 pounds.

Diagram No. 12 from front end, and No. 8 from back end of left hand cylinder. The pump diagrams are from a water cylinder in constant use, and are published to illustrate the correct action in the water cylinders of these pumps.

These pumps are not merely theoretical but have been put to the severest tests in the Cleveland Rolling Mill Co.'s works. Additional local interest attaches to these pumps from two facts: First, that the Cuyahoga Steam Furnace Co., of this city, has an arrangement with Mr. Martin to build them—a sure guaranty of first class construction—and secondly, in view of a proposition pending before the Cleveland Water Works Trustees for adding a Martin engine to their present plant. That the inventor has the fullest confidence in his engine from actual results, is evident by his guaranty of a duty of 110,000.000 foot pounds of water pumped for 100 pounds of coal consumed. It is, in conclusion, deserving of notice that no better evidence of this invention can be had than the fact that such high authority as Engineering, of London, requested data, and published an appreciative description of the Martin engine.

SOME INTERESTING EXPERIMENTS.

ARE THE SHOCKS, OCCURRING IN TEMPERING, ELECTRICAL?

Chemical and Structural Changes in the Manufacture and Hardening of Steel.

BY E. F. PRESTON.

SPECIALLY CONTRIBUTED.]

In an article lately published in this journal, the writer advanced the idea that in the process of heating and tempering steel, electricity was possibly generated, and that the consequent shock produced the crystalization of graphite, known to smiths generally as "burnt steel." Later experiments and observations have confirmed the opinion, and without presuming to treat the subject scientifically, we give our reasons for deductions from experiments made. It was discovered centuries ago, that iron could not be converted into steel in an open fire, and that carbon constituted the only difference between fine wrought iron and cast steel. It may have been known that oxygen is the carrier of carbon; that hydrogen combining with oxygen, produces combustion that is destructive to carbon; hence the necessity of loading iron with carbon in air-tight cases. Be this as it may, it has been discovered within a few years, that the injection of atmospheric hydrogen into a crucible of melted iron, containing a heavy per cent. of carbon, would produce combustion so powerful that the freed oxygen and carbon can be readily consumed, and that this process can be carried on until the iron is entirely decarbonized, or if stopped at a certain stage a good quality of crucible steel can be produced. In converting iron into steel, reducing the granules under the hammer, expelling impurities, producing homogeneousness, loading it with carbon, there is obviously a powerful chemical and structural change wrought. It is well known that gases generated by the heat of the furnace have much to do with the process, and that they must be carefully controlled or the results are ruinous. Carbon in cast steel is the product of the generation of carbonic acid and oxygen by heat. It doubles the tensile strength of iron, gives it density, and causes it to harden when heated and chilled. The offices and power of the gases generated in the process of tempering steel, as defined by scientists, are nearly as follows: CARBONIC ACID (gas) is a powerful extinguisher of combustion. It has the strongest affinity for oxygen of any known substance, and combined it occurs in the atmosphere as carbonic acid. It is soluble in water, two atoms of carbon to three of water. OXYGEN has the power of supporting combustion; combined with hydrogen, it constitutes eight-ninths of water. It constitutes nearly one-half the weight of all the solids. Supporting combustion, it is to hydrogen what powder is to fire. HYDROGEN is said to be the most powerful of all the gases; is fourteen and a half times lighter than atmospheric air, and has from four to six times the diffusive power possessed by oxygen, and a strong affinity for it. Combined with oxygen—two volumes of hydrogen to one of oxygen—it is one of the most powerful of explosives. Combined with atmospheric air, two volumes of hydrogen to five of air, it causes combustion, emitting an electric flash, forming a watery vapor, and a vacuum, into which fresh air rushing, causes a collision of its particles that gives out a report—thunder. (See Watts, or any good chemistry.) These gases, the most powerful known, are all generated and combined in the simple process of heating and hardening steel. Oxygen and carbonic acid are both strongly latent in steel, and are both generated and combined by the heat of the forge. Hydrogen is latent in the water of the chilling bath, and is also freed by heat. The power and offices of carbon and oxygen are well understood by the practical steel manufacturer. The power and destructiveness of hydrogen is also well understood, and every possible precaution is taken against its ruinous effects; hence air-tight cases in which to load iron with carbon, thus shutting out even atmospheric hydrogen. Taking these facts into consideration, it is a phenomenal wonder that steel can be hardened at any time in water, without destroying its tenacity. Can it be possible that this gas against which every precaution is taken in the manufacture of steel, works no harm in the process of tempering? Remembering that carbon and oxygen are latent in steel, and that heat frees them; that hydrogen is latent in water, and that at 648 deg. F. heat commences to decompose the water and free hydrogen, and that the volumes are increased in quantity and power in proportion to the heat applied; that the combination of these gases under ceriain conditions produces combustion, lightning, atmospheric vacuum, electricity, thunder, let the intelligent smith make the following experiments, and if he does not conclude that electricity has something to do with tempering steel, he will feel at least that science should explain the phenomena presented:

Take a piece of crude iron, heat to a white heat, and plunge it into cold water. As it has from three to five per cent. of carbon, we have a beautiful display of crystallization of graphite, as well as the power that produced it. The iron will crumble under the hammer almost as readily as sandstone, because, as we claim, the iron and carbon have been separated by crystalization produced by the shock of the combination of hydrogen with oxygen.

Again, a very good clinch-nail can be produced with a white heat and a cold chill, from a very poor cut nail, because the shock in the absence of carbon cements and gives density to the iron, hence toughness. Take three pieces of steel of the same bar, heat to a white heat; have some lime or fine ashes convenient, and take one piece from the fire and pack it in the lime as quickly as possible. (A better test would be to heat in a closed crucible, to the point of melting, and let it cool before taking it ont.) Let one piece cool in the open air, and drop the third into cold water. Now break the three pieces and compare the fractured surfaces. The annealed piece, if properly handled, will show but very little if any crystalization, and can be worked into a very good tool. The piece cooled in the air, will show the action of hydrogenic combustion in streaks. The piece chilled in water will show a complete crystalization of graphite, its separation from the iron, and is worthless. Take this same piece of "burned steel," heat to a blood red, and chill in water; repeat two or three times, and to casual observers the grain is refined and all right again. But examine it through a powerful glass, and it will be discovered that repeated expansion and condensation have pulverized the "burned carbon," but that cementation has not occurred, hence the weakness and worthlessness of the steel. These and kindred experiments show that it takes more than a common fire to burn the carbon out of steel. It can be melted in crucibles, recast into ingots, forged into bars, and while it may lose an indefinite amount of carbon, it will come out a finer grade of lower carbonated steel.

If our deductions are correct, if an electric shock is produced by the generation and combination of these gases in the manner described, we have common sense reasons, in lieu of the good or bad "luck" of the smith, for good or bad temper in tools. We have an intelligent reason why steel will show a burned condition from a red heat to-day and will not show it to-morrow; why a good temper can be produced at one time and nothing but failures at others. Water and atmospheric conditions necessary to the generation of these gases are known to be variable. Today both water and atmosphere are heavily loaded with carbon and oxygen, and a good temper is easily obtained. To-morrow hydrogen preponderates excessively and a poor temper with the most skillful manipulation is certain. Between the extremes we have all kinds of temper, ranging from the very best to a crystalization that ruins the tool entirely. It often occurs that this crystalization will show itself in spots, indicating uneven heating. But in any case ranging from a pronounced condition of "burned steel" to that which can only be discovered through a magnifying-glass, weakness, arising from a want of density and cementation of the granules, is present. What produces it? Every careful expert knows there

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SEVEN ACRES OF MACHINERY.

Continued from Page 2.

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The Agricultural Department I found very complete in all its details. There are a great many exhibitors here who have a full line of agricultural tools displayed. In the experimental farm on the grounds south of the main building may be seen a large and choice variety of farm and garden products, some of which are rarely ever raised in this climate. This little farm is being daily visited by many people who have no criticisms to offer, only praises for those who have had this part of the exhibits in charge.

The Mineral Department takes another very prominent place in the various displays of the Exposition. Here may be found the mineral resources of the South quite fully represented. The displays of iron, coal, ores, stone, etc., are various and large. Many of the exhibits in this department were brought here from the Atlanta Exposition. Besides, there is a large number of specimen minerals from all over the United States. Here I may also say that with the mineral wealth of the New South may also be classed large and extensive beds of clay, from which some of the finest porcelain and pottery may be made. It will fully repay anyone who will take the time to visit this valuable collection.

Probably there is no one among the vast number of exhibitors in Machinery Hall who has such a variety of machinery, engines. etc., as Mr. Herman Fletcher, one of "Falls City's" most enterprising and prominent business men. Below we give a description of the many exhibits made by Mr. Fletcher.

The only automatic self-regulating dynamo electric machine for arc lighting in the world, can be found prominent among the several agencies represented by the above named gentleman. This Electric Arc Light Machine, manufactured by the Thomson-Houston Electric Co., of Boston, Mass., is not the only electric arc in the world, but for the economical lighting of large spaces, as in factories of all kinds, warehouses, yards, docks, etc., by the electric arc, is now an established success. Besides its advantage in the matter of cost, it is preferable for various other reasons, chief among which are the following:

1st. Perfect control, being lighted and extinguished without the use of matches.

2d. Its safety from accidental leakage, and its non-employment of inflammable material.

3d. Its pure white color, displaying colors as perfectly as in daylight.

4th. Its penetrating power, causing it to illuminate the whole space, and not merely a limited portion.

5th. The absence of heating and vitiation of the atmosphere in which it is used.

6th. The ease of distribution, as to establish the new illuminant it is only necessary to run a circuit of copper wire connecting the generator and lamps.

With this system of electric lighting the greatest simplicity, durability and efficiency are attainable. The horse-power consumed varies with the size of lights, and may be stated to average 2-3 H. P. per large powerful light, such as are ordinarily estimated at 2,000 candle-power each. The carbons cost from a cent to a cent and a half per hour, per light.

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The Automatic Regulator is an attachment of simple construction which is secured to the machine, and adjusts the current to suit the number of lamps being at any time used. It serves also to compensate for changes in the speed of the generator due to unsteady power, so that the lights may be retained steady, even though the motive power does not furnish a constant speed. It serves further to adjust the commutator of the machine, and is especially valuable as a safeguard to the machine, and adds much to the security against fire.

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No makers of modern machine shears and punches have achieved a more enviable reputation than The Long & Allstatter Co. Their punches and shears, both single and double, are made of the best material, selected in every part with especial regard to the duty to be performed, and put together in the most exact and workmanlike manner. At all times they are under the most perfect control of the operator, and can be stopped or started at will. Either side of the double machines may be used while

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HOW EXPOSITIONS HELP.

EXTENSIVE SALES OF MACHINERY AT CINCINNATI.

Further Notes of Exhibits Interesting to Machinists.

SPECIAL CORRESPONDENCE.]

CINCINNATI, Sept. 26.—To some exhibitors of machinery this has been a very profitable week, as they have succeeded in disposing of many handsome pieces at very good prices. All the machinery exhibited this year has been pronounced by judges of this class of manufactures, as far superior to any former exhibit, and considering the small number of improvements that have been introduced within the past few years, it is a noticeable fact that they are valuable to both the seller and the buyer.

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Several fire escapes are exhibited, but the only one that is practically demonstrated, is the device invented by Mr. William Winkless, of Newport, Ky. The subject of safety is a very important one, especially during the burning of a large factory where girls are employed, or hotels, where there are always a large number of human beings, who are at the mercy of the flames, where there is not a suitable method of escape. The law compelling owners of such property to provide for the safety of their guests and employes, should be rigidly enforced, and every one who refuse to comply with its provisions should be summarily dealt with. It is hoped the Cincinnati Fire Commissioners will take this subject under due consideration, and that those who are more directly interested will take steps for the immediate erection or a suitable device for the safety of all concerned, as it was only recently that our city was the scene of a terrible holocaust in which nine lives were lost, simply because there was not the means of escape that should in accordance with the law have been provided. So much carelessness should not be tolerated for one moment, and the TRADE REVIEW will for one come to the front as an exponent of working classes who are left to the mercy of unscrupulous landlords, who refuse to regard the lives of those who are compelled to work in the large factories and machine shops.

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W. N. Brown & Co., of Madison, Ind., manufacturers of chair boring machines, have a very creditable display in the gallery of Machinery Hall.

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The Richmond Machine Works exhibit a light running saw mill, called the Pony Saw Mill, which will take in a saw of 56 inches and under, which they sell for $250.

***

Mr. Samuel Maxwell is exhibiting a new and important invention, which commends itself directly to the consideration of the public. It is an improved machine for bending hoops, patented June 19th, 1877.

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The display made by the Revere Rubber Co., of Chelsea, Mass., is one of the best in the belting line that has been made at any Exposition since the erection of the new buildings, and it is fully worth the while for seekers after this article to inspect.

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The Warner Elevator Model, located in the west end of area next to Machinery Hall, is attracting large crowds daily, as it is capable of raising two or three persons at a time, and when elevated to a distance of five feet the cable is slackened, which causes the dogs of the safety device to take hold and sustain the platform.

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The Machine Tool Works, of Philadelphia have sold one 72-inch radial drill to the O. & M Railroad Company. A duplicate of same drill has also been sold to West Shore, New York & Buffalo Railroad Company. They have also disposed of the following: One 16½-inch stroke x 62 in. swing slotting machine to O. & M. Railroad; one 17 inch square x 17 inch stroke crank planer, to O. & M.; one 55 inch x 18 feet, radial drill, 41 inch upright drill to New Orleans and Eastern Railway Company.

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The following pieces of machinery have been

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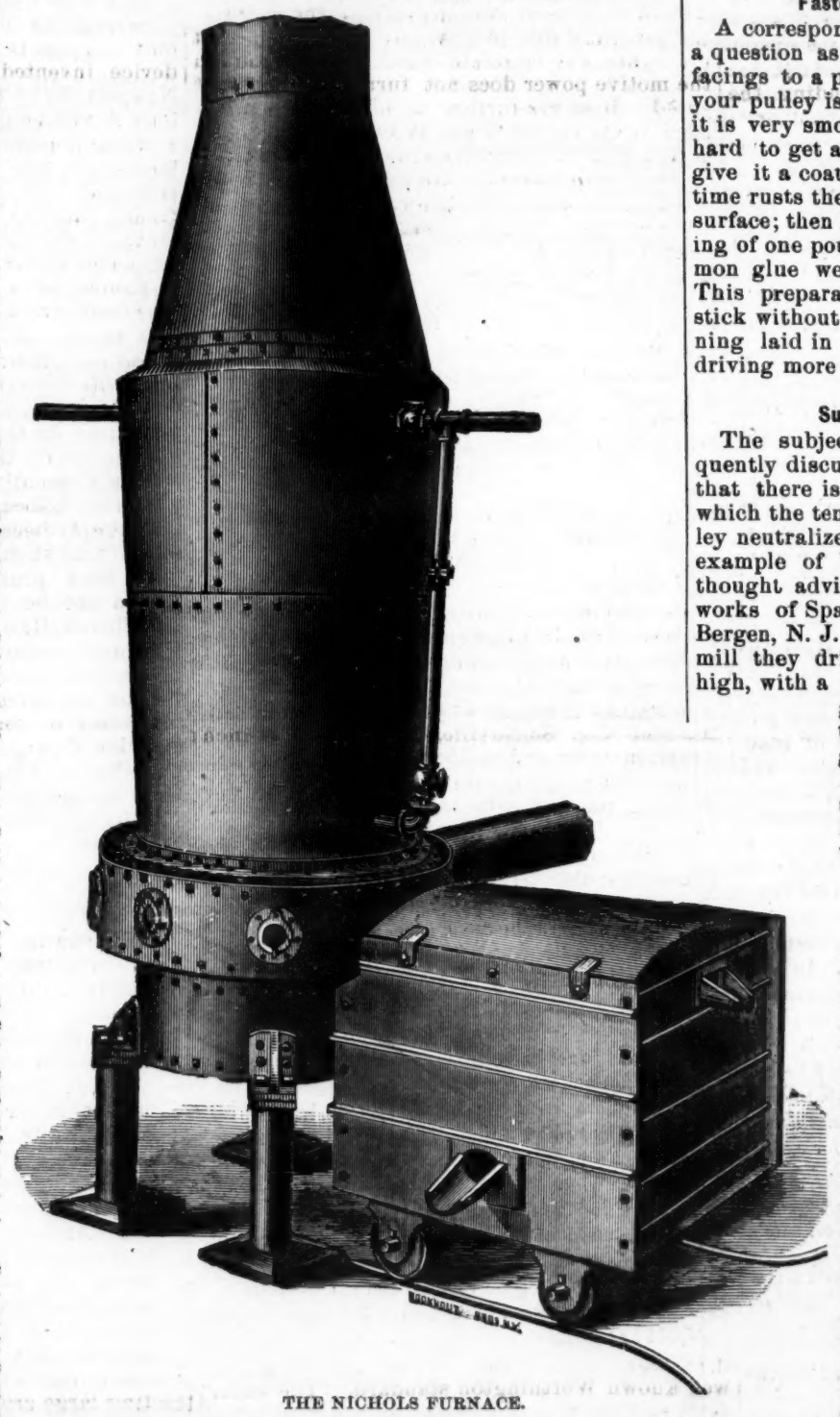
The Nichols Furnace.

The essential improvement in the furnace herewith illustrated is in the use of a removable outside well or hearth, into which flow both slag and metal as fast as smelted. The use of an outside well is not new, but the novelty and improvement, as claimed, consist in the method of making an immediate connection between well and furnace, which allows of a change of the former in a few minutes, should cutting or chilling render it necessary. Near the bottom of the furnace is an opening which in a 36-inch furnace is 7x6 inches, the circle of the furnace being flattened at this point to allow of close contact with the water-jacket face of the well. The face of the well is formed by two square frames of wrought iron, covered by soft sheet steel or boiler iron, in such manner as to leave a water space between, and the smaller inner frame corresponding in size and height to the opening in the furnace. The well itself is built of ribbed cast plates, bolted together, lined with fire-brick and mineral wool to prevent chilling, and mounted on wheels, with a flat arched brick-lined cover. Near the top, on the side away from the furnace, is a regular slag-spout, and below on one side, a tap-hole and spout for the metal, which can be tapped at intervals; or, in case of lead, a small outside dipping-well can be bolted on, as usual, on the furnace itself. The well is guided to its place against the furnace by the two outside rails, as shown in cut.

The connection is simply made by running the jacketed face of the well against the corresponding hole in the furnace, attaching rubber-hose connections to the water-supply pipes, and then letting the blast on to the furnace. Any slag which might naturally leak between the two faces is immediately chilled and forms a perfectly tight packing between them.

Among the advantages claimed for this invention are the following: the removal away from the furnace itself of all brick-work which can be cut by the slack admits of repairing without hindrance to the smelting operation; the discharge of the whole product of the furnace through the opening in the water-jacket itself, which is practically indestructible; the discharge into the well being below the level of slag issue from the same prevents all escapes of fumes and keeps the contents of the well uniformly hot; the discharge of slag being at a lower point than usual in furnaces exerts a favorable influence on the uniform working of the charges.

Three different sizes of these furnaces have been in use for several months at the Laurel Hill Chemical Works, Laurel Hill, Long Island, where they can now be seen, and where they are reported as working very satisfactorily on roasted pyritous ores containing between three and four per cent. of copper, the fuel employed being gas-coke. The manufacturers of these furnaces are Messrs. Fraser & Chalmers, Chicago. The patentees are Messrs. Nichols & Herrshoff.



THE NICHOLS FURNACE.

It is considered highly probable that the discovery of the cementation process for making steel had its origin in Liege, Belgium. At the commencement of the 17th century, in 1613, a permission to convert iron into steel is found to have been officially accorded to two armorers of Maestricht, a town which then belonged to the Province of Liege. Judging from this, the metallurgist, Karsten, was probably correct in saying that "England, which has now become the school of iron metallurgy, owes to the Continent two great discoveries—namely, that of the blast furnace and that of cementing steel."

Practical Mechanics.

Test Your Boilers.

A fair horse-power in a steam boiler is an evaporation of 30 pounds of water per hour, from a temperature of 212 deg. Ten pounds of water evaporated from a temperature of 212 deg. for each pound of coal is very high economy. Six pounds is fair work, and above the average. Under the best conditions, a horse-power can be got from an evaporation of less than thirty pounds of water. Every owner of steam power should weigh the water evaporated in his boiler, and also the coal used to produce such an evaporation. A measure of some kind that will show the weight of feed-water passing into a steam boiler with accuracy, should be used with all boilers when economy is an object. It should be the duty of a fireman to know the weight of fuel used as well as the weight of water. No man has any right to find fault with the economy of his boiler until he knows the amount of water evaporated per hour, and the amount of coal used to produce the same.

The Use of Standard Gauges.

To provide a set of standard gauges for use in machine-shop work, whether of the ring or plug form, or of the inside and outside caliper type, is an exceedingly good thing, but the task still remains of leading up to, and compelling, their intelligent and skillful use. This is sometimes a far more trying thing than to find the money needed for their purchase, for that usually depends upon one man or two only, while the use of the standards must be taught to all concerned, both good and bad together, so far as their readiness to apprehend such things is concerned. Even with the best men there is a certain amount of watchfulness needed lest, in their use of the same standards, they allow a personal error to creep into their measurements, which shall not be uniformly the same. At the worst, however, this chance of error, and the kind of watchfulness needed, are so vastly less when all use the same set of properly-made standards, than could be needed under any other conceivable arrangement, that the use of such appliances is almost invariably a source of real relief from petty inaccuracies, which are inseparable from the commoner kinds of measurement used in daily shop work.—[Industrial World.

Fastening Leather Facings.

A correspondent of an exchange, replying to a question as to the best way to fasten leather facings to a pulley, says: "In the first place, if your pulley is an old one that has run for years, it is very smooth, and in its present state it is hard to get anything to hold to it, so I should give it a coat of acetic acid, which in a short time rusts the pulley and gives it a very rough surface; then I should prepare a cement, consisting of one pound fish glue, one-half pound common glue well cooked in alcohol and water. This preparation I have no trouble in making stick without rivets. I now have a pulley running laid in this way, without a rivet in it, driving more than 75 horse power."

Successful High Belt Speed.

The subject of high belt speed is one frequently discussed, not a few taking the ground that there is a limit moderately low beyond which the tendency of the belt to leave the pulley neutralizes any advantages. An interesting example of belt speed beyond that usually thought advisable may be seen at the steel-works of Spaulding, Jennings & Co., at West Bergen, N. J. In the re-arrangement of their mill they drive a nine-inch train, three rolls high, with a 150-horse-power Westinghouse engine, and at a belt speed of more than 7,500 feet per minute, the engine running at 300 revolutions. Although, as will be seen, this speed is about ninety miles per hour, the driving appears to be entirely satisfactory.

Faults of Feed-pipes.

Robt. Wilson says: "In externally fired boilers the usual plan is to carry the feed-pipe from the crown down to within a few inches of the boiler bottom, which receives the impact of the cold water. The natural tendency of this mode of delivery is to lower the temperature of the plates in the vicinity of the feed-pipe orifice every time the water enters, thus increasing unnecessarily the wear and tear of the boiler. When the feed is not heated, and the plates on to which it is delivered are exposed to a high temperature, this practice is simply dangerous, and is one of the most frequent causes of transverse seam rips. Even with feed-water at a high temperature, say 250 deg. the difference between this and the temperature of the plates may still be very great."

Proper Firing.

I believe no flame should extend higher than the normal water line, as that part of the shell not protected by water and exposed to the action of the flame must become highly heated (when firing up cold boilers) before steam is formed, while the lower portion of the shell is comparatively cold. Moreover, no steam is generated by applying heat above the water line—it is only superheated. Would it not be better to close in the side walls on a line with the lower gauge-cock, and cover the top of boiler with some non-conductor, leaving a dead air-space between the covering and shell; also have the covering put on in sections, that it may be removed with dispatch in case of examination or repairs.—["Smoke Arch" in Mech. Engineer

SEVEN ACRES OF MACHINERY.

Continued from Page 2.

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This company is furnishing 34 arc lights supplied by three 12-light dynamos with automatic electric attachment. They use two arc lights in each of the four large courts, eight lights on Sixth street, also eight on Fourth street, in clusters of four lights each. The managers and exhibitors of the Exposition cannot speak too highly of the service given by these lights. It is also the brightest, steadiest and simplest light in use here. Two dynamos are run by a 26 H. P. Payne automatic engine, one dynamo by a 25 H. P. Westinghouse engine. They are also lighting eight saw mill buildings at the south end of the main building with one light to each building of 2,000 candle-power each. They also expect soon to introduce a half and quarter light.

Mr. Fletcher is agent for a large number of Eastern and Northern manufacturers of wood working machinery, iron working tools, special tools, etc. In his exhibit we found a full line of machines from the works of the H. B. Smith Machine Co,. Smithville, N. J.; one 24-inch planer, matcher and molder; one 7-inch and one 10-inch four-side molding machines; one No. 2 tenoning machine with coping heads; one Universal saw bench; one No. 2 band saw; one lock joint box machine; one 42-inch re-sawing machine; one heavy car mortiser, and one No. 2 new style mortiser. Of iron working machinery there was one 20 inch 8-foot bed engine lathe; one 16-inch 6-foot ditto; one large drill press; one 30-inch planer, 8-foot bed; one suspension driller. Mr. Fletcher has also two Phœnix engines, Syracuse, N. Y., on exhibition 10x14 and 7x14-inch cylinders respectively. He has on exhibition a full line of the insulated air coverings for steam boilers, steam, hot air, gas and water pipes, manufactured by Shields & Brown, Chicago, Ill.; the Waters engine governor; the Seibert cylinder oil cup, and two of the Durrell improved nut tapping machines, manufactured by Howard Bros., Fredonia N. Y. The Henry R. Worthington Hydraulic Works show four of their steam pumps for heavy service. One of these is a new mine pump or pumping engine recently brought out. So far as the steam end of this pump is concerned, the cylinders, valve motion, etc., do not differ from the well known Worthington standard. The water cylinders are four in number, each entirely distinct and subdivided as much as is practicable, for convenience of repairs, by renewal of small parts rather than pieces of large magnitude. Each piece or attachment of the cylinders is interchangeable between all cylinders without reference to their location.

No makers of modern machine shears and punches have achieved a more enviable reputation than The Long & Allstatter Co. Their punches and shears, both single and double, are made of the best material, selected in every part with especial regard to the duty to be performed, and put together in the most exact and workmanlike manner. At all times they are under the most perfect control of the operator, and can be stopped or started at will. Either side of the double machines may be used while

Continued on Page 10.

HOW EXPOSITIONS HELP.

EXTENSIVE SALES OF MACHINERY AT CINCINNATI.

Further Notes of Exhibits Interesting to Machinists.

SPECIAL CORRESPONDENCE.]

CINCINNATI, Sept. 26.—To some exhibitors of machinery this has been a very profitable week, as they have succeeded in disposing of many handsome pieces at very good prices. All the machinery exhibited this year has been pronounced by judges of this class of manufactures, as far superior to any former exhibit, and considering the small number of improvements that have been introduced within the past few years, it is a noticeable fact that they are valuable to both the seller and the buyer.

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Several fire escapes are exhibited, but the only one that is practically demonstrated, is the device invented by Mr. William Winkless, of Newport, Ky. The subject of safety is a very important one, especially during the burning of a large factory where girls are employed, or hotels, where there are always a large number of human beings, who are at the mercy of the flames, where there is not a suitable method of escape. The law compelling owners of such property to provide for the safety of their guests and employes, should be rigidly enforced, and every one who refuse to comply with its provisions should be summarily dealt with. It is hoped the Cincinnati Fire Commissioners will take this subject under due consideration, and that those who are more directly interested will take steps for the immediate erection or a suitable device for the safety of all concerned, as it was only recently that our city was the scene of a terrible holocaust in which nine lives were lost, simply because there was not the means of escape that should in accordance with the law have been provided. So much carelessness should not be tolerated for one moment, and the TRADE REVIEW will for one come to the front as an exponent of working classes who are left to the mercy of unscrupulous landlords, who refuse to regard the lives of those who are compelled to work in the large factories and machine shops.

***

W. N. Brown & Co., of Madison, Ind., manufacturers of chair boring machines, have a very creditable display in the gallery of Machinery Hall.

***

The Richmond Machine Works exhibit a light running saw mill, called the Pony Saw Mill, which will take in a saw of 56 inches and under, which they sell for $250.

***

Mr. Samuel Maxwell is exhibiting a new and important invention, which commends itself directly to the consideration of the public. It is an improved machine for bending hoops, patented June 19th, 1877.

***

The display made by the Revere Rubber Co., of Chelsea, Mass., is one of the best in the belting line that has been made at any Exposition since the erection of the new buildings, and it is fully worth the while for seekers after this article to inspect.

***

The Warner Elevator Model, located in the west end of area next to Machinery Hall, is attracting large crowds daily, as it is capable of raising two or three persons at a time, and when elevated to a distance of five feet the cable is slackened, which causes the dogs of the safety device to take hold and sustain the platform.

***

The Machine Tool Works, of Philadelphia have sold one 72-inch radial drill to the O. & M Railroad Company. A duplicate of same drill has also been sold to West Shore, New York & Buffalo Railroad Company. They have also disposed of the following: One 16½-inch stroke x 62 in. swing slotting machine to O. & M. Railroad; one 17 inch square x 17 inch stroke crank planer, to O. & M.; one 55 inch x 18 feet, radial drill, 41 inch upright drill to New Orleans and Eastern Railway Company.

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The following pieces of machinery have been

Cantinued on Page 10.

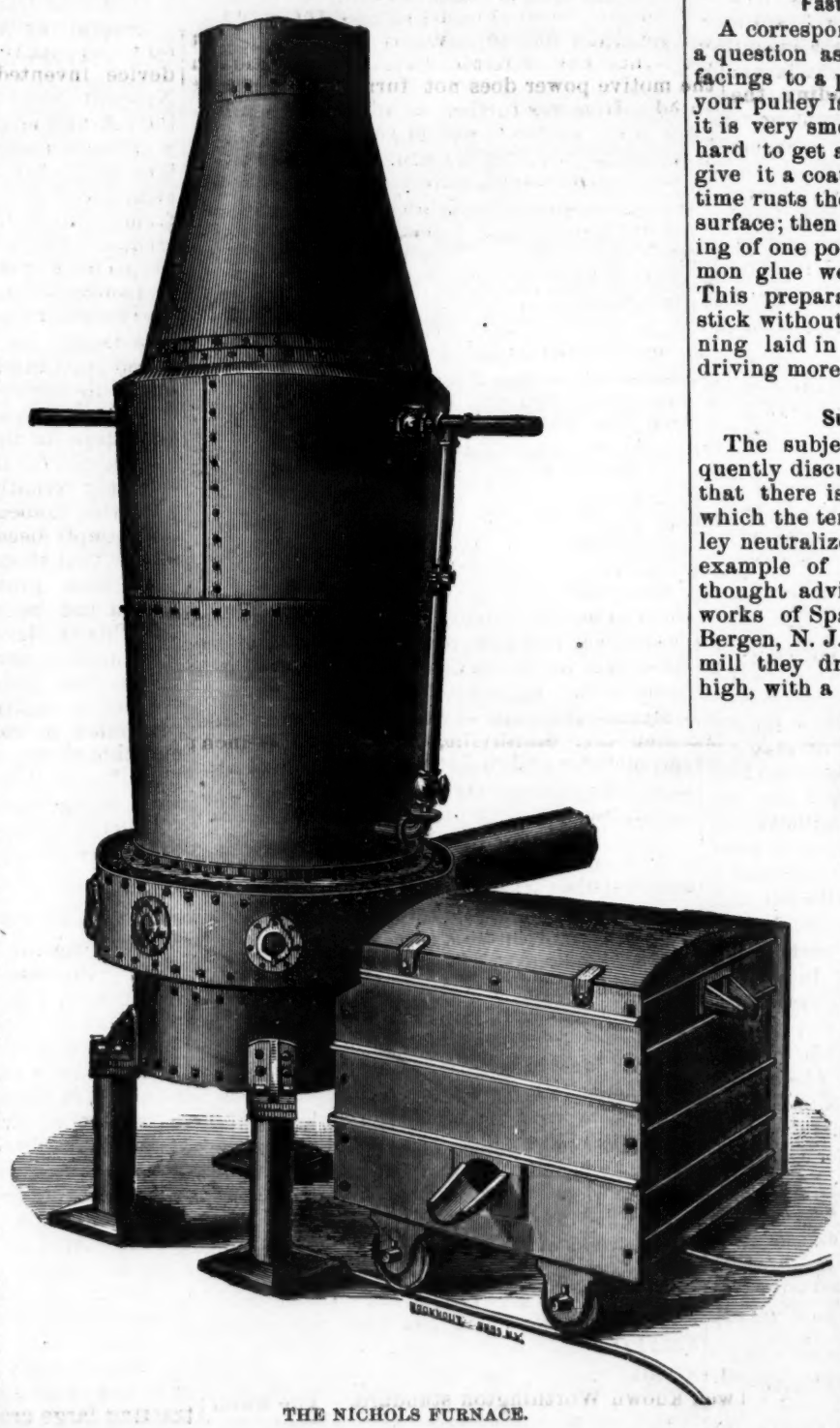
The Nichols Furnace.

The essential improvement in the furnace herewith illustrated is in the use of a removable outside well or hearth, into which flow both slag and metal as fast as smelted. The use of an outside well is not new, but the novelty and improvement, as claimed, consist in the method of making an immediate connection between well and furnace, which allows of a change of the former in a few minutes, should cutting or chilling render it necessary. Near the bottom of the furnace is an opening which in a 36-inch furnace is 7x6 inches, the circle of the furnace being flattened at this point to allow of close contact with the water-jacket face of the well. The face of the well is formed by two square frames of wrought iron, covered by soft sheet steel or boiler iron, in such manner as to leave a water space between, and the smaller inner frame corresponding in size and height to the opening in the furnace. The well itself is built of ribbed cast plates, bolted together, lined with fire-brick and mineral wool to prevent chilling, and mounted on wheels, with a flat arched brick-lined cover. Near the top, on the side away from the furnace, is a regular slag-spout, and below on one side, a tap-hole and spout for the metal, which can be tapped at intervals; or, in case of lead, a small outside dipping-well can be bolted on, as usual, on the furnace itself. The well is guided to its place against the furnace by the two outside rails, as shown in cut.

The connection is simply made by running the jacketed face of the well against the corresponding hole in the furnace, attaching rubber-hose connections to the water-supply pipes, and then letting the blast on to the furnace. Any slag which might naturally leak between the two faces is immediately chilled and forms a perfectly tight packing between them.

Among the advantages claimed for this invention are the following: the removal away from the furnace itself of all brick-work which can be cut by the slack admits of repairing without hindrance to the smelting operation; the discharge of the whole product of the furnace through the opening in the water-jacket itself, which is practically indestructible; the discharge into the well being below the level of slag issue from the same prevents all escapes of fumes and keeps the contents of the well uniformly hot; the discharge of slag being at a lower point than usual in furnaces exerts a favorable influence on the uniform working of the charges.

Three different sizes of these furnaces have been in use for several months at the Laurel Hill Chemical Works, Laurel Hill, Long Island, where they can now be seen, and where they are reported as working very satisfactorily on roasted pyritous ores containing between three and four per cent. of copper, the fuel employed being gas-coke. The manufacturers of these furnaces are Messrs. Fraser & Chalmers, Chicago. The patentees are Messrs. Nichols & Herrshoff.



THE NICHOLS FURNACE.

It is considered highly probable that the discovery of the cementation process for making steel had its origin in Liege, Belgium. At the commencement of the 17th century, in 1613, a permission to convert iron into steel is found to have been officially accorded to two armorers of Maestricht, a town which then belonged to the Province of Liege. Judging from this, the metallurgist, Karsten, was probably correct in saying that "England, which has now become the school of iron metallurgy, owes to the Continent two great discoveries—namely, that of the blast furnace and that of cementing steel."

Practical Mechanics.

Test Your Boilers.

A fair horse-power in a steam boiler is an evaporation of 30 pounds of water per hour, from a temperature of 212 deg. Ten pounds of water evaporated from a temperature of 212 deg. for each pound of coal is very high economy. Six pounds is fair work, and above the average. Under the best conditions, a horse-power can be got from an evaporation of less than thirty pounds of water. Every owner of steam power should weigh the water evaporated in his boiler, and also the coal used to produce such an evaporation. A measure of some kind that will show the weight of feed-water passing into a steam boiler with accuracy, should be used with all boilers when economy is an object. It should be the duty of a fireman to know the weight of fuel used as well as the weight of water. No man has any right to find fault with the economy of his boiler until he knows the amount of water evaporated per hour, and the amount of coal used to produce the same.

The Use of Standard Gauges.

To provide a set of standard gauges for use in machine-shop work, whether of the ring or plug form, or of the inside and outside caliper type, is an exceedingly good thing, but the task still remains of leading up to, and compelling, their intelligent and skillful use. This is sometimes a far more trying thing than to find the money needed for their purchase, for that usually depends upon one man or two only, while the use of the standards must be taught to all concerned, both good and bad together, so far as their readiness to apprehend such things is concerned. Even with the best men there is a certain amount of watchfulness needed lest, in their use of the same standards, they allow a personal error to creep into their measurements, which shall not be uniformly the same. At the worst, however, this chance of error, and the kind of watchfulness needed, are so vastly less when all use the same set of properly-made standards, than could be needed under any other conceivable arrangement, that the use of such appliances is almost invariably a source of real relief from petty inaccuracies, which are inseparable from the commoner kinds of measurement used in daily shop work.—[Industrial World.

Fastening Leather Facings.

A correspondent of an exchange, replying to a question as to the best way to fasten leather facings to a pulley, says: "In the first place, if your pulley is an old one that has run for years, it is very smooth, and in its present state it is hard to get anything to hold to it, so I should give it a coat of acetic acid, which in a short time rusts the pulley and gives it a very rough surface; then I should prepare a cement, consisting of one pound fish glue, one-half pound common glue well cooked in alcohol and water. This preparation I have no trouble in making stick without rivets. I now have a pulley running laid in this way, without a rivet in it, driving more than 75 horse power."

Successful High Belt Speed.

The subject of high belt speed is one frequently discussed, not a few taking the ground that there is a limit moderately low beyond which the tendency of the belt to leave the pulley neutralizes any advantages. An interesting example of belt speed beyond that usually thought advisable may be seen at the steel-works of Spaulding, Jennings & Co., at West Bergen, N. J. In the re-arrangement of their mill they drive a nine-inch train, three rolls high, with a 150-horse-power Westinghouse engine, and at a belt speed of more than 7,500 feet per minute, the engine running at 300 revolutions. Although, as will be seen, this speed is about ninety miles per hour, the driving appears to be entirely satisfactory.

Faults of Feed-pipes.

Robt. Wilson says: "In externally fired boilers the usual plan is to carry the feed-pipe from the crown down to within a few inches of the boiler bottom, which receives the impact of the cold water. The natural tendency of this mode of delivery is to lower the temperature of the plates in the vicinity of the feed-pipe orifice every time the water enters, thus increasing unnecessarily the wear and tear of the boiler. When the feed is not heated, and the plates on to which it is delivered are exposed to a high temperature, this practice is simply dangerous, and is one of the most frequent causes of transverse seam rips. Even with feed-water at a high temperature, say 250 deg. the difference between this and the temperature of the plates may still be very great."

Proper Firing.

I believe no flame should extend higher than the normal water line, as that part of the shell not protected by water and exposed to the action of the flame must become highly heated (when firing up cold boilers) before steam is formed, while the lower portion of the shell is comparatively cold. Moreover, no steam is generated by applying heat above the water line—it is only superheated. Would it not be better to close in the side walls on a line with the lower gauge-cock, and cover the top of boiler with some non-conductor, leaving a dead air-space between the covering and shell; also have the covering put on in sections, that it may be removed with dispatch in case of examination or repairs.—["Smoke Arch" in Mech. Engineer

Market Review.

OFFICE OF TRADE REVIEW AND WESTERN MACHINIST.
CLEVELAND, FRIDAY EVENING, September 28, 1883.

IRON ORE.

There has been a good inquiry the past week, and sales of Bessemer ores to considerable amounts have taken place. We hear of transactions ranging from 3,000 to 5,000 tons. The advance in lake freights has had a tendency to lessen the amount of ore shipped from the mining regions, and the prediction is made that this will result in stripping the market and stiffening prices. Menominee Range ores are all sold up, and of course there is little doing in these, though that is no indication as to the general market. Non-Bessemers are bringing little better prices than we have been quoting, and Menominee Range are quotable a trifle lower. Receipts the past week have been 37,403 tons; shipments 15,413 tons. Compared with the same time last year, there is at present a falling off this year in receipts at this port of about one half, though shipments are about the same. This would seem to indicate that the margin between receipts and sales is much nearer this year than last, and that the docks will carry much smaller stocks at the close of navigation this season than in 1882. Lake freights are still steady at $1.50 from Escanaba and $1.70 to $1.75 from Marquette. Shipments from Lake Superior ports up to and including September 19th were 1,599,370 tons, against 2,142,965 tons for the same period in 1882. We quote for the local market:

No. 1 Specular and magnetic Bessemer Ores per ton	$7.00@ 7.50
No. 1 Specular (non-Bessemer) ores per ton	5.50@ 6.50
Bessemer Hematites	5.00@ 5.25
Non-Bessemer Hematites	4.75@ 5.00
Menominee Range Bessemer	6.25@ 6.75
Menominee Range non-Bessemer	4.75@ 5.00

Receipts and shipments of iron ore at Cleveland each day the past week have been as follows:

Date.	Receipts (tons).		Shipments (tons).	
Sept. 20	6,884	"	1,588	"
" 21	2,146	"	2,523	"
" 22-23	2,202	"	3,298	"
" 24	3,529	"	1,455	"
" 25	4,622	"	3,190	"
" 26	18,026	"	3,359	"
Total	37,403	"	15,431	"
Last week	20,436	"	15,673	"

CINCINNATI.

[Reported for the TRADE REVIEW by Rogers, Brown & Co.]

A good deal of pig iron has changed hands the past week and negotiations are in progress for other lots of considerable size. Many large buyers have enough faith in the market to make liberal contracts, if they can force holders to concessions in prices. The general run of buying, however, is for immediate delivery to cover immediate wants. So far as this section is concerned it is believed consumption is running up to the full limit of former years. Where talk is heard of reduced orders and dullness, it refers in many, perhaps most cases to prospective rather than present business. In all lines of the trade the tendency is to conservatism, people buying about as much as formerly, but buying close, and for immediate wants only. This naturally leads to much doubt and speculation about the future. There is renewed talk about furnaces blowing out, but no actual stopping worthy of note. Demand continues about uniform for the different grades. We quote for cash:

Hot Blast Foundry.—Hanging Rock Charcoal, No. 1, $23 50@$24 50; Hanging Rock Charcoal, No. 2, $22 00@$23 50; Southern Charcoal, No. 1, $22 00@$23 50; Strong Coke, No. 1, $20 00@$21 00; Strong Coke, No. 2, $18 50@$19 00; Strong Coke, No. 3, $18 00@$18 50; Soft Stone Coal, No. 1, $20 00@$20 50; Soft Stone Coal, No. 2, $18 00@$19 00. Forge—Strong Neutral No. 1 mill, $17 00@$17 50; Cold Short No 1 mill, $16 00@$17 00. Car Wheel & Malleable—Hanging Rock Cold Blast, $31 00@$33 00; Hanging Rock Warm Blast, $25 00@$27 00; Southern Car Wheel Iron, $26 50@$27 50; Lake Superior Car Wheel Iron, $25 00@$26 00: Lake Superior Malleable Iron, $25 00@$26 00.

[Reported for the TRADE REVIEW by E. L. Harper & Co.]

The constituent elements of the market are unchanged. There is an improved tone, however, inquiries being quite numerous and volume of business slightly increased. We quote as prices current:

FOUNDRY.—Hanging Rock Charcoal, No. 1, $23 75@$24 25; Hanging Rock Charcoal, No. 2, $22 50@$23 25; Strong Neutral Coke, No. 1, $19 50@$20 50; Strong Neutral Coke, No. 2, $18 00@$19 00; American Scotch, No. 1, $18 50@$19 00. GREY FORGE.—Neutral Coke, $17 50@$18 00; Cold Short, $16 50@$17 00. CAR WHEEL AND MALLEABLE—Hanging Rock, Strictly Cold Blast, $28 00@$28 75; Hanging Rock Warm Blast, $24 00@$24 50; Lake Superior, "Vulcan," all grades $26 50; Southern Car Wheel Strictly Cold Blast, $28 00@$29 00.

CHICAGO.

[Reported for the TRADE REVIEW by A. B. Meeker & Co.]

The market is reasonably active, with a good general demand and a number of sales of round lots of Lake Superior charcoal at fair prices. We quote to-day (Sept. 25.

Lake Superior Charcoal, 1 & 2, $23 00@$24 00; Lake Superior for Car Wheels, No. 3, $23 50@$25 00; Lake Superior for Car Wheels, 4 and 5, $24 00@$25 00; Scotch, according to brand, No. 1, $27 00@$28 00; Hanging Rock, Charcoal, No. 1, $25 00@$26 00; Hanging Rock Coke, No. 1, $21 00@$23 00; Anthracite, No. 1, $22 00@$23 00; Anthracite, No. 2, $21 00@$22 00; American Scotch, No. 1, $23 00@$26 00.

AT OTHER LAKE ERIE PORTS.

[Specially reported for the TRADE REVIEW:

FAIRPORT, O., Sept. 26.—Receipts of iron ore at this port for the week ending September 26, have been as follows:

Date.	Receipts (gross tons.)	Shipments (gross tons.)
Sept. 20. . .	658	———
" 24. . .	1492	———
Total. . . .	2140	———

PIG IRON.

Dullness still reigns, notwithstanding the time has come and passed for the expected revival. Comparatively nothing is being done, and there is no immediate prospect for any improvement. Sales are in small lots for immediate delivery. There is no especial demand for one particular grade over another except, possibly, for softeners, and no scarceity is reported in any quarter. Furnace men are trying to get prices raised so as to cover lake freights, but are not succeeding. Consumption is not quite equal to that of last year. We quote:

CHARCOAL PIG IRON.

No. 1 Lake Superior charcoal	$23.00@25.00
No. 2 Lake Superior charcoal	23.00@25.00
Nos. 3 and 4 Lake Superior	24.00@27.00
Nos. 5 and 6 Lake Superior	23.00@25.00
Nos. 1, 2, 3, 4, 5, Salisbury	35.00@37.00
Southern Car Wheel	28.00@33.00

BITUMINOUS AND COKE IRON.

No. 1 foundry, all lake ores	$21.50@22.50
No. 2 same	20.00@21.00
No. 1 foundry, lake ores, with cinder mixture	20.50@21.50
No. 2 same	19.50@20.50
No. 1 foundry, native Ohio ores	21.00@22.00
No. 2 same	19.00@20.50
No. 1 silvery, native Ohio ores	21.00@22.00
No. 2 same	18.00@20.00
No. 1 gray forge, red short	19.00@20.00
No. 1 gray forge, neutral	18.00@19.00
No. 1 Bessemer	22.00@23.00
No. 1 "Arnold" American Scotch	24.00
No. 2 " " "	23.00

Receipts and shipments of pig iron at Cleveland the past week have been as follows:

Date.	Receipts, tons.		Shipments, tons.	
Sept. 20	718	"	102	"
" 21	148	"	25	"
" 22-23	696	"	37	"
" 24	13	"	73	"
" 25	253	"	37	"
" 26	921	"	56	"
Total	2,749	"	330	"
Last week	1,942	"	573	"

MANUFACTURED IRON.

Sheets and plates are most in demand, but the market shows no especial activity. Structural irons are in good demand, and iron bars are moving off reasonably well. Receipts of bar iron in Cleveland the past week have been 838 tons; shipments, 902 tons.

RAILS.—Shipments of steel rails show an increase over those of last week, being 1,121 tons for this week against 767 tons last week. Shipments of iron rails the past week have been 446 tons. The mills are running moderately.

HARDWARE.

Trade is fair but not up to jobber's expectations, as country dealers are still cautious, buying only for immediate wants. Winter goods, such as zincs, stoves, pipes, etc., are in most demand. Horseshoes and builders' hardware also have a ready market. A considerable scarcity seems to prevail in Russia iron, both imported and American. On account of buyers holding off, wholesale dealers are looking for a good fall trade to set in before long. Collections are, if anything, not quite as good as last week, especially in districts where corn has been blighted by frost. We lower prices on wrought spikes, painted and galvanized wire and solder, and advance discounts on bright and annealed wire.

The File Manufacturers' Association have advanced the quotation of files from discount 45 per cent. to discount 40 per cent.

NAILS—Are in good request, and stocks are fair. Receipts the past week have been 3,364 kegs; shipments, 5,354 kegs.

COAL.

The market is in excellent condition; receipts and shipments have been heavy, and the mines are all running quietly. Business continues brisk, with a perceptible improvement in the wholesale market over last week. The demand for tonnage has been active, in view of the expected early closing of navigation. Lake freights have taken a decided upward jump, and indications point to a further advance. Quotations may be placed at 75c. to Chicago and Milwaukee, (80, it is reported, could be obtained if the vessels were here;) 40c. to Detroit: $1.25 to Duluth; 75c. to Green Bay; $1.50 to St. Lawrence River points. Transportation of coal has been quite heavy, as will be seen.

Receipts and shipments of coal at Cleveland each day the past week have been as follows:

Date.	Receipts (tons).		Shipments (tons).	
	Anthracite.	Bituminous	Anthracite.	Bituminous.
Sept. 20	579	5,150	..	1,023
" 21	386	6,362	32	2,379
" 22-23	239	6,255	64	673
" 24	83	5,445	16	1,850
" 25	212	4,080	62	1,028
" 26	173	4,750	...	1,270
Total	1,672	32,042	174	8,223
Last week	2,469	29,579	130	10,256

Stocks of Anthracite in the East have been steadily reduced, and production has approximated almost 2,000,000 tons in excess of a like period in 1882.

Local receipts of coke the past week have been 2,251 tons.

Contracts and Construction.

MUNCIE, Ind., asks bids for water works.

A NEW 200-cell jail is to be built at Pittsburgh.

A WOODENWARE factory is projected at Greenville, Mich.

THE Elk Rapids, Mich., Iron Company will build a large mill.

A NEW Presbyterian church is in process of erection at Willoughby, O.

A $1,000,000 iron and brick court-house is to be built at Pittsburgh.

A NEW court-house, is to be erected at Nashville, Washington County, Ills.

PROJECTED hotels: At Bellevue, Mich., Brainerd, Minn. ($50,000), and at Detroit (Antisdel House to be remodeled and rebuilt).

THE Brush, Maxim and Fuller electric companies have bid for lighting Meadville, Pa. The contract has not yet been awarded.

PROJECTED churches: At Battle Creek, Mich., Presbyterian; at Flintville, Mich., Catholic; at Unity, O., Union; at West Middlesex, O., United Presbyterian; at Youngstown, O., English Congregational; at Muskegon, Mich., French Catholic and Congregational; at Ann Arbor, Mich., Baptist.

SOME INTERESTING EXPERIMENTS.

[Concluded from Page 5.]

is a damaging mystery about it, often credited to his carelessness, and he uses the happy term "luck" to cover his ignorance of the power of the gases generated. Since every precaution is used to control these gases in the manufacture of steel, in order to produce desired results, is it not time that some practical remedy should be found that will control them in the process of tempering? We think the problem of producing uniformity of good temper is reduced to the simple question of how can the combustion of oxygen and hydrogen be prevented?

Further Furnace Records.

Reprinting the article in this journal relative to "Furnace Records," the American Manufacturer, Pittsburgh, adds the following data:

One of the furnaces of the Edgar Thomson Steel Works—D Furnace, we believe,—made 300 tons in one day, and one of the other furnaces at the same works exceeded this, but we cannot at present say how much. The company has five furnaces, each of which is 80x20, except A Furnace, which is 65x13. It is said that the latter furnace, small as it is, has made larger yields than any furnace in England, notwithstanding furnaces have been erected in that country having boshes over 30 feet in diameter. In this connection, to illustrate the wonderful increase in the capacity of blast furnaces within the last few years, it may be stated that a blast furnace in this city which not many years ago was set down in Mr. Swank's directory as having an annual capacity of 20,000 net tons is credited with 45,000 net tons in last year's directory. This wonderful increase of output is stated to be wholly due to a change in the shape of the furnace. The furnace is 67x18. In view of facts like this, it is easy to understand why so many of the blast furnaces of the country are idle.

Forming Steam Instantly.

A firm in Paris has patented an invention for the instantaneous formation of steam, which permits of its use at once in the cylinder of the engine. A pump sends the required quantity of liquid between two plate surfaces, which are heated, and between which there is only a capillary space. The liquid spreading in a thin layer evaporates at once, without going into the spheroidal state, and this steam acts in the cylinder as fresh formed steam. The speed of the pump is regulated by the engine, the pump being connected with the shaft of the engine.

Cleveland Wholesale Prices.

[The lowest quotable prices are given in all cases.]

HARDWARE.

Adzes.

Carpenter's.....per doz $18 40
Ship..... " " 18 75
Heavy railroad.. " " 19 50

Axes.

per doz.
James' 2d qual..... $7 00
Buckeye..... 7 75
" doub. bitt..... 15 00
Hunt's..... 9 50
Mami's..... 8 00
Lippincott's Crown..... 8 50
Cut More..... 9 00
Peck's Double Bit..... 22 00
"Champion Blade..... 11 00
Good triple silver steel.. 11 50

Axles.

Standard list,....
Nos. 1 to 6, 50 & 10 off
Nos. 7 to 14, 50 & 5 off
Nos. 15 to 18, 45 off
Nos. 19 to 22, 50 & 5 off

Anvils.

per lb.
Eagle, Amer.....10c dis 20
Wright's.....11¼c@11c
Armitage's Mouse Hole.....9¼c@9¾c
Trento..... 10¾c
Wilkinson's..... 10¾c

Anvil Vise and Drill.

Millers Falls Co. $28.....dis 20
Cheney Anvil and Vise dis25&2

Augurs and Bits.

C S cut augers.....dis 50&10
do do do bits..... 50&10
D C gimlet do Ives.. dis 50
Snells bits.....dis 40&10
Russell Jennings' augers, dis 10&10&10
Cook's pat augur.....40&10

Animal Pokes.

Akron.....$ 3 50
Camp's..... 4 00
Berea, per doz..... 4 00
Eagle, per doz..... 5 00

Apple Parers.

Domestic&Reading ℔ doz.$7 00
Turn Table..... 4 50

Bolts.

Machine..... dis 70
Plow..... dis 40
Plow, R. B. & W.... dis 40
Cast Iron Barrel Shutter, etc.....dis 55&10
Cast Iron Chain (Sargent' list).....dis 60&10
Ives' Pat. Door Bolts. dis 50
Wrought Barrel.....dis 55&10
Wrought Square.....dis 55&10
Wr'g't Shut'r, all iron, Stanley's list.....dis 50&10
Tire, R. B. & W., new list.....dis 70&10
Stove, American Screw Co.'s..... dis 40
B. B. & W.....dis 40
Bolt Ends 16c. per lb net... 70

Bellows. Dis

Hill,s.....40 pr cent
Bl'ksmith's com new list,50 ct
Moulder's new list, dis 25 ℔ ct
Hand, new list, 25 per cent

Butts. Dis

Wrought brass..... 70
Cast, loose joint.... 60&10
Pin, loose..... 55&10
Wrought, fast joint narrow..... 50&10
Wrought fast joint broad..... 50&10
Wrought loose joint broad..... 55&10
Wrought table and back flaps..... 50&10
Loose joint, without acorns..... 55&10
Ten per ct. extra dis for cash.

Boiler Plates.

"Gaylord"-Standard Quality.
C. No. 1.....4 50
C. H. No. 1 Sheil.....4 75
C. H. No. 1, 50,000.....5 25
C. H. No. 1, 55,000.....5 75
C. H. No. 1 Flange.....6 50
Firebox
T. S., 60,000 .....(as per)..6 50
T. S., 65,000 .....(act of)..
Homo. Steel, 70,000 (of Cong) 7 50
Heads, ¼c ℔ lb. extra.
N.B.-Eastern brands of boiler plate at from 2-10 to 3-10c ℔ lb less than above prices.

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch .....dis 25
"National" Special Locomotive Tubes.....net list

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Boiler Makers' Tools.

Doty's Power Shears ..net list
" Hand Lever Shears.net list
" Power Punch.....net list
" Hand Punch.....net list
Steel Screw Punch.....net list
Iron Screw Punch ....net list
Boiler Plate Rolls.....net list
Buffalo Forges&Blowers dis 20
Watson's " " net list
Spring Tube Expander ..dis 15
Roller Tube Expander.net list
National Tube Cleaner .dis 20
Wire Flue Brushes ....net list
Anvils—'Peter Wright' 12½ ℔ lb
Solid Box Vises net list

Cleveland Stamped Elbows

Genuine Russia Iron

4½inch, per doz			5 50
5	do	do	7 50
6	do	do	9 50
7	do	do	11 00

Charcoal Iron

4½inch, per doz			2 50
5	do	do	3 50
6	do	do	4 25
7	do	do	5 50

Planished Amer. Russia Iron

7½inch	per doz		5 00
4	do	do	6 50
5	do	do	9 50
6	do	do	8 05

Discount 33⅓ per cent

Chisels.

Hot and cold cutting...℔ lb 30
Railroad track..... 30
Machinists..... 30
Mallet head..... 50
Cape..... 50
Packing..... 50
Stone cutters..... 50

Crowbars.

Cast steel..... ℔ lb 7
Iron,steel points..... 5c

Cutlery, Pocket and Table.

Meriden Cutlery Co., table net
Am. Miller Bros.' Cutlery Co.....dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co. list net
Aaron Berkenshaw's pocket dis 25
Fram Cutlery Co., . table net
Cleveland Cutlery Co...dis 25
Miller Bros., pocket.... 33⅓
Akron Cutlery Co.....dis 45

Coopers' Tools.

Bradley's ..... dis15@20
Braton's ..... dis15@20

Chains.

Coil by cask,....

3-16	¼	5-16	⅜	7-16	½
10¼	9	8	7	6½	6¼

Drills and Drill Stocks.

Blacksmiths', each $2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W ...dis 20&10

Drawing Knives.

Peck, Stow & Wilcox....dis 70
Witherby's .....dis 65@10
Nobles Mfgr. Co 15
Adjustable handle 20

Emery and Sand Paper.

Regular Numbers .....℔ lb 6c
Flour and F. F.....℔ lb 4c
B. & A. Emery Paper ...dis 35
Sand paper .....dis 35

Enameled & Tinned Ware.

Kettles.....dis 50
Sauce Pans.....dis 30
Tinned Sauce Pans.....dis 30

Files.

Parkin's $5 to £..dis 45 ℔ cent
E.M. Boynton's, new list dis 25
J. & Riley Carr .....4.50 to £.
Johnson & Bro. .....dis 50
Butcher's.....4.50 to £.
Walter Spencer & Co.'s " Diamond ".....4.50 to £.
Fisher's.....4.75 to £.
Moss & Gamble.....4.50 to £.
H. Disston & Sons (new list)..... dis 40 per cent
Heller Bros.' Horse Rasps dis 35
Nicholson..... dis 40
New American..... dis 40
Union File Co..... dis 40

Grindstones.

Beroa.....1@1½ ℔ lb
Ohio.....1¼@1⅞ ℔ lb
Nova Scotia.....1¼@1½ ℔ lb
Lake Huron.....1@1½ ℔ lb

Hammers.

Maydole's .....dis 15
Cheney's.....dis 25
Hartford Hammer Co.....dis 20
Humason & Beckley.....dis 50
Verree.....dis 5
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75,dis25&10
Nelson Tool Works..dis 40&10
Warner & Noble's .....dis 5
Kip's.....dis 15

Hatchets.

Buckeye.....Shingling,
Nos..1, 2, 3,
℔ doz $7 50,$8 00,$8 50,dis 40
Claw,
Nos..1, 2, 3,
℔ doz$8 25,$8 75,$9 25, dis 40
Lathing,
Nos.....1, 2, 3,
℔ doz $7 50.$8 00,$8 50, dis 40

Hinges.

Champion double acting spring hinges .....dis. 30
Screw & Strap 8@12 in. ..$5. net
Gravity Locking Blind Hinges, Sargeant & Co. 70&10
Clark & Co.....70&10

Locks.

Whipple Mfg Co .....50 &10
Norwalk Lo Co .....45&10&10

Nails.

20 to 60d	$2 90
8 and 9d	25
6 and 7d	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅝ inch	3 00
4d barrel	1 00
1¼ inch barrel nails	1 50
1¼ do do do	1 75
1 do do do	2 50
⅞ do do do	3 00
Cut spikes, all sizes	35
Clinch nails, all sizes	1 75
Casing and box nails	75
Finishing nails,	$1 25
Tobacco nails,	50

Nuts and Washers

Nuts, square ..... 8c off list.
Nuts, hexagon.....9c. off list.
Washers.....7c off list.

Nuts, Bolts, etc.

Machine Bolts .....dis 70
Bolt Ends .....dis 70
Boiler Patch Bolts.....net list

Picks.

Railroad, 4 to 5 lbs.. doz $6 60
5 to 6 lbs.. 7 20
to 7 lbs.. 7 80
7 to 8 lbs.. 8 40
Railroad Tamping Pick.. 7 to 8 lbs..doz 10 80
Mill Picks per lb..... 75c

Planes.

Ohio Tool Co .....dis 20
Sciota.....dis 25
Bailey's Pat. Adjstbledis 20@10
Sandusky, fancy .....dis 15
Buckeye .....dis 20
Ogontz .....dis 25

Rivets.

on .....dis 40
nned .....dis 40
opper .....dis 500

Rules.

Stanley..... .....dis. 70 & 10

Squares. D..s

Steel or iron, case lots.....50
Try squares and T bevels....40

Spikes—WROUGHT

All lengths by ¼ inch .....4 c
do do do 5-16 ..... 3½c
do do do ⅜, 7-16 & ½in 3

Shovels and ..des.

Ames' new list, July 1, 1881, ...dis 15
Old Colony.....dis 15
Remington's (Lowman's Patent).....dis 30
Bishop .....dis 50
Chisholm.....dis 25@30
Rowland's .....dis 50
Griffiths .....dis 50

Sad Irons.

From 4 to 10 lbs.. per lb 3 net
Self-Heating.....℔ doz $9 net
" Tailors..℔ doz $18 net
Gleason's Shield and Toilet .....dis 25
Mrs. Pott's Irons, double pointed.....dis 35
M rs. Pott'sIrons, square back.....dis 35
Enterprise Star Irons ....dis 35
Combined Fluter and Sad Iron.....℔ doz $15, dis 15

Saws.

Disston .....dis 20
Disston's Circular .....dis 40
Disston's hand panel, rip, &c.....dis 20
Boynton's lightning cross cut new list .....dis 40
Boynton's circular and mill .....dis 40
Boynton's ice.....dis 25
Boynton's lightning hand panel and rip .....dis 25
Livingston's butcher and kitchen.....dis 20
Livington's framed wood Nos. 101 102 103 104 105 doz $10 8.50 10 7.50 6.20 net
Peace circular & mill...dis 40
Peace hand panel and rip .....dis 25
Peace band saws, all widths.....dis 10

Scales.

Hatch, Counter, No. 171... ℔ doz. $42, dis 37½&10
Union Platform.....$6, dis 45
Fairbanks'.....dis 20
Buffalo Scale Co.....dis 40
Forsyth Scale Co.....dis 25
Howe's.....dis 20&10
Chatlilon's Eureka.....dis 25
Family Un versal.....dis 50
Scale Beams.....dis 33⅓&10

Screws. Dis

Flat head iron or steel [new list] per cent dis. 55
Flat head brass..... 55
Round head iron or steel 50
Round head brass..... 45
Brass and Silver capped. 30
Japanned, list of Plain Screws..... 40
Coach, patent Gimlet point, list per 100..... 65
Lag, taper points..... 70
Bed..... 10
Machine, flat head, iron. 55
round head, iron 50
Bench, iron..... 55&10
wood, beech, per doz $3..... 10
wood, hickory .....20&10

Tinners'Tools & Machines

Machines(P.S.&W.) ... less 10
Tools (P. S. & W.)..... " 20

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe dis 70&10
Malleable Iron Fittings.... 20
Grey Iron Fittings ....dis 50
Steam Brass Goods.....dis 55
Water " " .....dis 50
Ludlow Gate Valves ...dis. 20
Register Gauge Cocks net 1 00
Montg'ry Gauge Cocks $1 each
Steam Gauges.....dis. 40
Steam Guages 5 in. net dial per doz..... 30 00
Scotch Glass Tubes.....dis. 70
Tools..... special.
Duplex Injectors.....net.
Soil Pipe & Fittings, Mott's List.....dis. 30
Sinks, Mott's List.....dis. 25
Copper Bath tubs, sinks, etc.....dis. 25
Galvanized Iron Boilers "Scaifes."..... dis. 50
Marble Slabs, Counter-sunk net per ft.....$ 1 25

Sheet and Tank Rivets.

"Norway."

All sizes.....dis. 15

Boiler Rivets—"Albany."

⅛, ¼, 11-16, and ⅝ in. diam .5 00

Valves. Dis.

Jenkins' Patent Gate Valves.35
" " Globe ..40
" Standard Packing " .20

Vises.

Solid Box, list of July 1, '79,.....dis 45
Solid "Crown" (A. H. Hildick).....40 to 100 lb. 15c net
Solid, Peter Wright's.....15¼
Solid, Wilkinson's.....13¼
Parallel, Parker's.....dis 10
" Simpson .....dis 20
" Prentiss.....dis 15
Saw Filers, Hopkins' ℔ doz $17.50, dis 10
" Wentworth's .. 9 00
Reading.....dis 45&10
Cowell Hand Vises.....dis 20
Richardson's Vise and Anvil.....dis 25

Wrenches.

Coe's genuine..... 50
Girard Standard....dis 50 & 10
Mechanics' 10 and 10....dis. 50
P. S. & W. Mechanics dis 50&10
Agricultural.....dis 70

Wire.

Brass and Copper.....dis 30
Bright & annealed, Nos. 0 @ 18 dis 60@62½
" " Nos. 19 @ 26 dis 65
" Nos. 27 @ 36 dis 70
Coppered Nos. 0@18, dis 55@60
Galvanized, Nos. @18, market list..... dis 45@50
Tinned, Nos. 0 @ 18, dis 45@47½
Cast steel.....dis 40
Tinned Broom Wire, Nos. 18 @ 25.....dis 55
Annealed Fence, Nos. 8 and 9.....dis 60
Annealed Grape, Nos. 10 to 14.....dis 60
Galvanized Telegraph, Nos. 7 to 9 ..... ℔ 1
Galvanized Telegraph, Nos 10 to 11..... ℔ lb 8¼c
Galvanized Telegraph, No. 12..... ℔ lb 10½c
Fence staples... ℔ lb 5½@5¾c
Fence Staples, galvanized, ℔ lb 6½@6¾c
Stubs Steel Wire $6 00 to dis 30
Barb Wire, painted..... 6
Barb Wire, galvanized .. 7 c
Crucible Steel Ropes fro ⅜ in. at 9c to 1¼ in. at.....52c
Best Selected Iron Ropes from 3-16 in. at 8c. to 1¼ in. at.....33c

TINNER'S STOCK.

Tin.

Banca,.....per lb. 23⅜
Straits..... " 23 c
English..... " 23c
Bar..... " 24½c

Tin Plate,

IC 12x12 charcoal.....$ 6 75
IC 14x20 do..... 6 50
IX 14x20 do..... 8 25
DC 12½x17 do..... 7 00
DX 12½x17 do..... 9 00
DXX, 12½x17 do..... 11 00
DXXX, 12½x17 do..... 13 00
IC, 20x28 do..... 13 75
IX, 20x28 do..... 17 25
IC, 14x20, Best Roof.... 5 75
IX, 14x20, do..... 7 50
IC, 20x28 do..... 12 00
IX, 20x28 do..... 15 00
IC, 10x14 Best Coke..... 6 00
Subject to card discount.

Solder.

Half and Half, in bars....14½
No. 1 do 13½
Spelter Solder..... 25
Pat Planished Sheet Iron (A) ..... per lb 10½c
(B)..... " 9c

Nos	10	15	21	25
to	14	20	24 & 26	
Com	3-10	3-30	3-40	3-75
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra.

Zinc.

Sheet, cask..... 6¼c
Sheet, open.... ..... 6¾c

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Bra.

All Nos not thinner than 10 No. 28, wider than 2 in. not wider than 14 inch 30c
All Nos to No. 28 inclusive, and widths over 14 to 20 in. inclusive 35c
All Nos to No. 28, inclusive, and widths over 20 to 30 in. inclusive 38
¼c per lb advance on each No above Nos 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at 53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c pr lb. more than High Brass
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars 48c
Sawed 51c
Planed or Polished...54c

For Slitting.

Metal in width in. to ¼ in. to No. 28, inclusive, 1c per lb., advance.
Metal, in width 2 in. to 1 in. thinner than No 28, 2c per lb. advance
Metal, in width ¼ in to ¼ in. thinner than No 28, 5c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths add 7c per pound.

COPPER.

Lake Ingot.....15¼@16c
Baltimor .....14¾@15
Arizona..... ... 15@15¼c

sheathing Brazier Copper, Bolts, etc.
All sizes, 16 oz. per sq. foot, and over, per lb 25c
" nd over per lb.....25c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 25c
Brazier's Copper, 10 oz and 12 oz. per sq. ft...per lb. 27c
Brazier's Copper lighter than 10 oz. per sq. ft.. per lb. 34c
Circles less than 84 inches in diameter .... per lb. 33c
Circles 84 inches in diameter and over .....per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz. per sq. ft... per lb. 24c
Bolt Copper.....per lb. 28c
Copper Bottoms per lb. 28c
No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x48 .....per sheet 6c
All other size sheets, 2½c per square foot. For tinning i th sides, double the above amou.

LEAD.

Americ'n, ℔ lb..... 4¾c
Bar, ℔ lb.....5½c
Pipe, ℔ lb 6¾c dis 10 per ct
Sheet, ℔ lb 7¼c dis 10 per ct
Tin-lined pipe 15c dis 10 per ct
Block .....45c.
Chilled Shot... ..... 8c

Babbitt Metal.

Babbit Metal, No. 3, 14 X			42
Babbit Metal, No-2, 16 XX			46
Babbit Metal, No. 1, 18 XXX			50
Babbit Metal, C			20
Babbit Metal, B			24
Babbit Metal, A.			32

Dis 40 per cent.

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch			1 90
4¼ to 6 by ⅜ to 1 inch			2 00
1¾ to 6 by 1¼ to 1½ inch			2 30
1¼ &1¾ by ⅜ to ¼			2 00
1 & 1¼ by ⅜ to ⅝			2 10
⅝ ⅝ and ⅞ by ⅜ to ⅝			2 30
Round,			
1	to 1⅜ inch		1 90
2	to 2⅝		2 10
2¾	to 3¼		2 40
3¾	to 4		2 90
4¼	to 4½		3 40
4¾	to 5		3 60

Square.

1	to 1⅜ inch		1 90
2	to 2⅝		2 10
2¾	to 3¼		2 40
⅜	to 4		2 90
3¾	to ⅞		2 00

Heavy Band.

1½ to 6 by ¼ and 5-16 inch 2 10
1 to 1⅜ by ¼ and 5-16 do 2 20
¾ to ⅞ by ¼ and 5-16 do 2 40
⅝ to ¾ by ¼ and 5-16 do 2 80

Half Oval and Half Round.

Wagon box iron ¼ and ⅜ 3 50
1-10c per lb extra will be charged for cutting to specified lengths

Light Band.

1½ to 6 by ¼ to 3-16..... 2 70

Hoops.

1¼ to 2 , Nos 16 to 18..... 3 10
1¼ to 4 do 13 to 15..... 3 00
1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	3 50
No 25 to 26	3 70
No 27	3 90
No 28	4 30

English Steel.

Best cast..... ℔ lb	16c
Extra cast.....	16½c
Round machinery..	10c
Swaged, cast	18c
Best double shear ..	15½c
Blister, 1st quality..	13c
Refined tool steel....	16½c
Spring calking	7¼@7½c
German steel, best ..	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15½c
2d quality	14½c
3d quality	12½c

American Steel.

Best brands of refined cast steel, ¼ to 2 inches..	12c
Crucible cast	7c
Open-hearth ditto ...	4½c
Hammer cast steel ...	9c
Spring cast steel.....	½c
Bessemer and open-hearth spring.....	½c
Ditto plow.....	¼c
Steel boiler plate	6¼@7c
Bessemer machinery.5	@6c
Spring and calking ...	7¼@7c
Tire	4
Sleigh shoe.....	4

Bessemer Steel Tire.

¼ to 1 by 3-32	4 ℔ lb
¼ to 1 by ¼ to 5-32 ...	4 ℔ lb
¼ to 1 by 3-16 to ⅝ ...	4 ℔ lb

Miscellaneous Cast Steel.

Auger and auger bit.....	10
Axle steel for wagons.....	7
Frog points and plates.....	8
Frog size bars	8
Pick, hammered.....	10½
Mattock, beveled.....	9
Table cutlery.....	7½
Trap spring steel.....	10
Pike and cant hook.....	8½
Coal and granite.....	9

SCRAP IRON AND OLD METAL.

DEALER'S BUYING PRICES

	Per Ton
No. 1 R R wro't scrap....	$20
No. 1 wrought scrap.....	19
No. 1 Machine cast scrap.	14
Stove plate (free from burnt iron).....	11 00
Grate bars	7
Pipes and flues (clean)....	15
Tank iron.....	14
Hoop and band iron.....	10
Light sheet iron.....	9
Axle turnings.....15 00@16 00	
Wro't turning (f from cast)	13
Wro't iron, oily drillings 9@10	
Cast borings..... 9 00	
Malleable iron.....	9
Uncut wro't iron boilers..	19
Old copper per lb.....	15
No. 1 H. Brass per ℔.....	11
Heavy yellow Brass do.. 9@11	
Light Brass per ℔.....	7@9
Scrap Zinc per ℔.....	2@3
Tea Lead per ℔	3
Heavy Lead per ℔	4

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe

Inside Diameter. Inches.	Plain, Price Per Foot.	Galvan or Enameled Per Foot.	Outside Diameter Inches.	Weight Per Foot.
⅛..	08		.40	.24
¼..	08	$0 11	.54	.42
⅜..	09	12	.67	.56
½..	11	15	.84	.85
¾..	13½	19	1.05	1.13
1...	19	28	1.31	1.67
1¼..	27	40	1.66	2.26
1½..	33	47	1.90	2.69
2 ..	46	64	2.37	3.66
2½..	75	1 00	2.87	5.77
3 ..	95	1 30	3.50	7.55
3½..	1 25	1 70	4 00	9.05
4 ..	1 50	2 05	4.50	10.73
4½..	1 75	2 40	5.00	12.49
5 ..	2 25	3 00	5.56	14.56
6 ..	2 75	4 00	6.62	18.76
7 ..	3 75	....	7.62	23.00
8 ..	4 75	....	8.62	28.00
9 ..	6 50	....	9.68	34.44
10 ..	8 00	....	10.75	40.64
12 ..	12 00	....		54.65

Discount, car load lots, 70 and 10 per cent Less than car load 70 to 70&5.

COAL,

WHOLESALE.

Wholesale f.o.b. cars at Cleveland:

Carbon Hill and Monday Creek	$2 50
Massillon .....2 70@3 00	
Palmyra, lump..... 3 25	
Brier Hill..... 3 25@3 50	
Pittsburgh 3 00	
Salineville 2 25	
Tuscarawas..... 2 40	
New Hazelton 2 50	
New Hazelton, mix 1 20	
" " nut 2 00	
Connotton..... 1 15	
Connotton, mix 2 00	
" nut..... 2 00	
Anthracite grate..... 5 40	
Anthracite egg..... 5 58	
Anthracite stove 5 85	
Anthracite chestnut.... 5 98	

RETAIL.—Delivered.

Massillon Lump.....	$4 00
" Nut	3 75
Carbon Hill and Monday Creek, lump	3 50
Carbon Hill and Monday Creek, nut	3 25
Straitsville, lump.....	3 75
Straitsville, nut.....	3 50
Palmyra, lump..... 4 25@4 50	
New Hazelton	3 50
Connotton.....	3 00

75c less on cars by car load.

Anthracite Stove and Chestnut	6 75
Egg and grate	6 50

OILS.

Pure Oils. p'kages included	
Sperm, winter bleached per gal.....	1 80@1 83
Whale, winter bleached per gal.....	68@66
Straits	47@50
Bank.....	45@47
Lard oil extra W S..	65@68
do No 1 do.....	5 @58
do No 2 do.....	50@53
Tallow oil.....	67@70
Neatsfoot oil pure..	95@$100
do No 1	80@85
Linseed oil, raw	57@60
do do boiled	60@63
Cotton seed oil white	55@58
do do yellow	54@57
West Virginia lubricating 28 deg.....	15c@20c
Paraffine oil winter pressed.....	22@25
Capitol Cylinder.....	8
Model do	6
Eldorado Engine..	5
Turpentine, per gal..	4

GLASS.

(Per box of 50 feet)

SINGLE THICKNESS

6x8 to 10x15.....	8 00
11x14 to 15x24.....	9 00
16x24 to 20x28.....	10 25
15x34 to 24x30.....	11 25
26x28 to 24x36.....	12 00
26x36 to 26x44	13 50
26x46 to 30x50.....	14 58

DOUBLE THICKNESS Dis60&20

6x8 to 10x15.....	12 25
11x14 to 15x24.....	13 75
16x24 to 20x28.....	16 25
15x34 to 24x30.....	17 75
26x28 to 24x36.....	19 00
26x36 to 26x44.....	20 75

Dis. 70

SEVEN ACRES OF MACHINERY.

Concluded from Page 6.

the other is at rest, and every part is arranged with special reference to the convenience of the operator. The No. 0000 machine will cut a sheet of tissue paper at one stroke and at the next shear of a bar of iron three and.three-quarter inches in diameter. The adjustable helve-cushion hammer, made by The Long & Allstatter Co., is another specimen of the perfection of their designs. The concussion of the blow is absorbed by rubber cushions, and by a device peculiar to this machine the helve and all operating mechanism may be raised or lowered six inches to suit the work.

The Akron Iron Co., of Akron, O., have an elegant display of their Patent Hot-Polished Shafting. They occupy a prominent place in the machinery department in the southeast section. They exhibit 34 different sizes of shafting from 12-16 inch up to 3 15-16, varying by sixteenths. They have supplied the exposition with two lines of main shafting, each being 350 feet long, and used for transmitting power for some of the the heaviest machinery in the building, beside several hundred feet of counter shafting.

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The "Cummer" Engine Co., Cleveland, O., have in use here one of their 150-horse-power engines. They furnish power for running thirty-one different machines in Machinery Hall. It is marked and valued here by its appearance and good work, easy, smooth and noiseless. The engine really sells itself to those who are ready to buy. Four have been sold already to the following: Adams Cotton Mills, Montgomery Ala., 150 H. P. St. Louis Basket Co., St. Louis, Mo., 137 H. P. Brose & Arnold, flouring mill, Evansville, Ind., 105 H. P. J. E. Hart, flouring mill and elevator, Jacksonville, Fla.. 150 H. P. Also two steel boilers and entire outfit. Mr. Myles, who has charge of the engine, is also negotiating for the sale of three more to different parties in the South.

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J. W. Penfield & Son, Willoughby, O., have one of their brick and tile machines in operation. It takes well—in fact, they took the first premium at the State Fair at Columbus. They have a variety of all kinds of brick and tile displayed.

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Bickford & Huffman of Macedon New York, manufacturers of grain drills (Farmer's Favorite) have on exhibition four machines two plain and two complete with fertilizer attachment. This is the oldest firm making drills in the United States, having made drills since 1844. They make peg and spring tube drills. In the former, when obstructions are encountered endangering tubes, a peg is broken which has to be replaced. In spring tube drills the spring acts automatically releasing the hoe when roots or stones are emcountered and bringing the hoe to a proper position for work after they are passed. A prominent feature peculiar to this drill is its double force feed. Every drill, whether plain or with fertilizer attachment, has two distinct feeds, the one adapted to sowing wheat and rye, the other to the distribution of corn, stock peas, oats, barley, &c. The change from the one to the other is effected in an instant, thus giving the farmer practically two drills in one. Again a larger range of sizes is found here than in any other drill, running from 8 to 11 hoes, all of which may be peg or spring hoes and with or without fertilizer attachment. Messrs. B. & H. made no drills specially for exhibition, believing farmers and planters should see here just what they have for sale and their drills on exhibit were taken out of stock, differing in no wise from those sold every day by their agents.

For the ordinary operations of seeding wheat, rye and grass seeds and distribution of fertilizers, they acknowledge no superior and in sowing accurately and uniformly the larger grains they have no successlful competitors. They are represented by O. Brumfield, of Lousville, Ky. general agent for Kentucky.

The Hodkins & Son pony planer, rotary-bed planer, surface or panel planer, and planer with buzz attachment, also water valves of different sizes, attract attention. A full line of milled, machine set and cap screws manufactured by the Rochester Machine Screw Co., Rochester, N.Y. Whiting Bros. Manufacturing Co., Cedar Rapids,Iowa,display two of their latest improved automatic improved cut-off engines for meeting the wants of printing offices, brick machines, and light manufacturing establishments, for which Mr. Fletcher is also agent.

Sheriffer & Son's Challenge patent double-headed ejectors,also a full line and different sizes of the Peerless injector. Latta's new improved 20 inch lever drill, 5¼ feet high; has cut bevel wheels, rack and pinions; steel spindle and countershaft; spindle 1 7-16 inches in diameter, with 10½ inches traverse, Morse taper; column 4½ inches in diameter; table (16 inches diam.) which turns in the arm, swings round on the column, is fitted with elevated rack and pinion, and has 20 inches vertical traverse. A full line gang lath mills, mill machinery, wood sawing machines, gang edgers, made by the Three Rivers Manufacturing Co., Three Rivers, Mich. George L. Cady, portable engine lathe, with double or single belted foot motion,also portable foot lathes of different sizes and descriptions.

Trevor & Co's. shingle, heading and stave machines, drag saw machines and improved gauge lathes.

The Hendey Machine Co., Farrington, Conn., have five machines exhibited, one 15 in. shaper, one 16 in. x 16 in. x 4 ft. planer, one 24 in. shaper, and two sizes of their new style hand lathes with patent lever attachment for tail spindle.

Colburn's improved blind stile spacing and boring machine, which has a capacity of 8,000 holes, made by L. S. Colburn, Oberlin, O.

"Fletcher's" patent adjustable hanger.

All sizes of valve engines from Phœnix Foundry and Machine Co., Syracuse, N. Y. These engines are neatly painted and handsomely finished.

Emery wheels all sizes manufactured by the Lehigh Valley Emery Wheel Co., Weissport, Pa.

Milling machinery made by the Simpson and Gault Manufacturing Co., Cincinnati, O.

Portable and stationary engines and boilers from Spangenberg, Pendleton & Co., Warren, O.

The standard improved "Eclipse" rock drill, from Ingersoll Rock Drill Co., New York. These drills are either run by steam or compressed air as circumstances require, and are so arranged that they can be shifted from one style of mounting to another at will.

We also find B. W. Payne & Son's steam engines among Mr. Fletcher's exhibits. Among the highly important principles and features of these engines and boilers is their unique and handsome design, and in this sense they make the most attractive exhibit of this class of engines at the Exposition. This firm are the only builders in the United States that have successfully put an automatic cut-off on medium and small sized engines, and sold them at a figure that can be positively classed as low priced. A second feature of their display is the non-explosive sectional Eureka boiler, which carries the guarantee of this firm that it cannot explode under any circumstances or from any causes, which has secured for it the largest sales of any single style of boilers since its appearance in the country. They are also exhibiting a high speed automatic engine, which drives two of the Thompson & Houston dynamo electric arc lights. The market for their engines is not confined to the United States, but extends throughout the civilized world. It is admitted by those in authority to express an opinion, that these gentlemen have the most perfect engine shops in the United States.

NOTES.

Wm. Myles, Cleveland, O., is representing the "Cummer" Engine Co.

Samuel Taylor, Esq., is representing Millard & Coombe, of St. Louis.

J. W. Penfield & Son, Willoughby, O., are represented by Mr. Jesse E. Eastes, general agent.

The Keystone Manufacturing Co., Sterling, Ill., is well represented by J. B. Mingbe, Esq., of the same place.

The genial and happy A. L. Boyden, Esq., general agent of the Akron Iron Co., Akron O., has charge of the company's exhibit here. He reports sales to new customers and advertising very satisfactory.

R. F. Curtiss, Esq., manager of the sales department of White Sewing Machine Co., has charge of their elegant display here.

Robert Allstatter, Esq., of the Long & Allstatter Co., Hamilton, O., is attending the Exposition and looking after the company's interests in general.

W. A. Taylor, of Turner, Vaughn & Taylor, Cuyahoga Falls, O., has been taking in the Cincinnati Exposition and is now taking in the sights here for a day or two.

The Crystal Emery Co., Northampton, Mass., manufacturers of patent solid emery and corundum wheels, are very busy and report a good trade in the west and south. They manufacture wheels from two to 36 inches in diameter. They claim a superiority over other wheels made and believe that in making their patent process wheels they wear better and twice as long as any other.

HOW FXPOSITIONS HELP.

Concluded from Page 6.

sold by The Cordesman & Egan Company. This firm is one of the most enterprising wood-working machinery manufacturers in the West: One patent friezing or shaping machine, with patent friction foot reverse; one solid iron frame buzz planer or jointer with extra long tables, and adjustable fence. The latter machine is sold to the Evansville Furniture Co., Evansville, Ind. One improved universal wood-worker with both bearings adjustable. Sold to Frank Voss, Newport, Ky. A No. 2 patent scroll saw sold to the Evansville Furniture Co. One patent double roll sand-papering machine, sold to Evansville Furniture Co. Mr. Egan, of the above named company is one of Cincinnati's most enterprising young business men.

Mechanical Curiosities.

Among the many curious things exhibited at the Louisville Southern Exposition are thirteen medallions or castings of iron representing Christ and the twelve apostles. These were cast from native ores nearly one hundred years ago at the old Bellewood Furnace upon the Cumberland river in Eastern Tennessee, in molds made of green sandstone.

A perpetual clock was started at Brussels a little over a year ago. An up-draught is obtained in a tube or shaft by exposing it to the sun; this draught turns a fan, which winds up the weight of the clock until it reaches the top, when it actuates a brake that stops the fan, but leaves it free to start again after the weight has come down a little. At the last of June the clock was running perfectly, after having been in motion for nine consecutive months.

A second electric boat, 46 feet in length, capable of carrying 50 passengers, has just been launched on the Thames. The motive force lies concealed in 70 boxes, each of one-horse power, stored under the floor of the boat, and at the end there is a Siemens dynamo, the spindle of which is continued so as to form the screw, without intermediate gearing. A speed of nine miles an hour can be maintained for six or seven hours, when the secondary batteries have to be replenished. There is no noise, or heat, or smoke, or smell, or waste, and the machinery takes up so little room that practically the entire boat is available for passenger accommodations.

At an exhibition of the Daft electric motor, at Greenville, N. J., last week, says the New York Tribune, among the interesting exhibitions of electricity was the running of the saws in the sawmill at the rate of 2,800 revolutions minute by a current transmitted through a mile of wire; but more astonishing than all else was the running of the electric motor up and down a track with a grade of 2,000 feet to the mile. This feat, in which electricity laughed at the laws of gravitation, and set at defiance all previous performances attempted by steam motors, would have seemed incredible had it not been witnessed by a dozen practical men.

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The auger shaped steam passage gives the steam a spiral motion the entire length of tubes, thereby thoroughly cleaning a set of tubes in 5 minutes.
Improving the draft, saving fuel and labor.
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Manufacturers of Aitchison & Doolittle's

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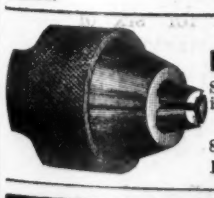
The most simple, durable and economical. It saves from 15 to 25 per cent on labor and fuel.
Send for circulars and price list of Cleaner and Hose. Good, reliable, energetic agents wanted. eow 93



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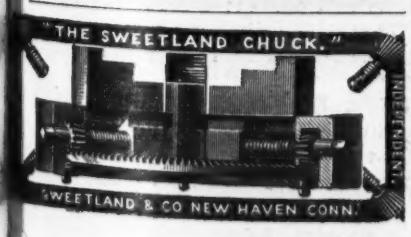

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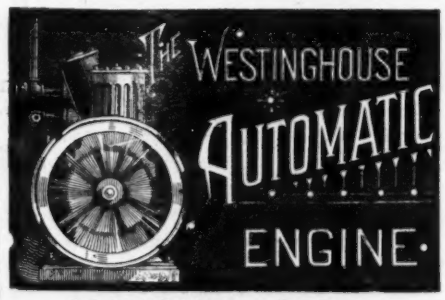

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XX HEATING STOVE,

	Diam. of Bottom.	Diam. of Fire Chamber.	Height of Stove.	Weight.
No. 5, XX,	26 inches.	18 inches.	40 inches.	180 pounds.
No. 6, XX,	30 inches.	19 inches.	42 inches.	255 pounds.
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Your attention is called to our CELEBRATED XX HEATING STOVE, which we guarantee is surpassed by none in the market for cheapness, durability, and heating purposes. It has been in the market for the past 16 years and has always given the best of satisfaction, and is particularly adapted for Hotels, School Houses, Churches, large Offices, Machine Shops, R.R. Depots, Round Houses, &c. The dimensions and weights are just as represented. Should you be in need of a large size heating stove we would specially recommend the Nos. 8 and 9.
Write for Prices and Circular of heating and cooking stoves. 15

Power Transmitting Machinery.

SHAFTING,

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RHODES & CO. Coal, Iron Ore and Pig Iron. 101 St. Clair street. 1

DALLIBA, J. H., Iron Ore. Grand Arcade Building, 101 St Clair st. 51

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THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts. 41

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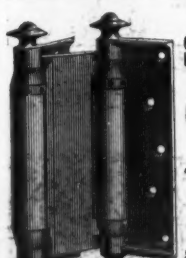

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The Engines are mounted on an A frame, bolted to a strong bed-plate, and by the side of the boiler, but not dependent upon the boiler, making the most convenient double engine, taking up less space, and can do more and better work than any other of the same dimensions.

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AN AUTOMATIC DEVICE

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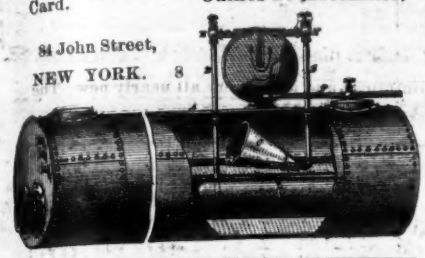

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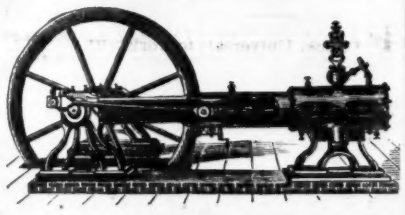

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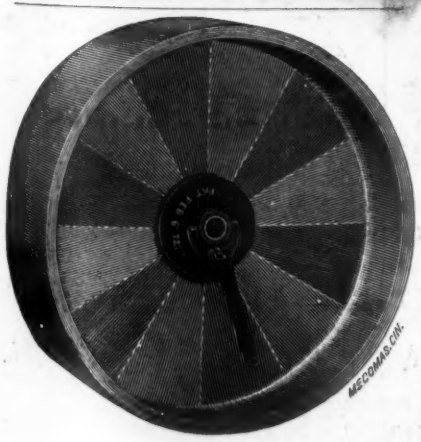

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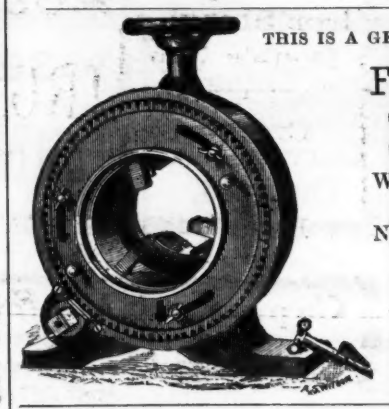

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The Reservoir is of planished copper, with deep, stamped pit, protected with cast iron, and is effectually heated without an extra damper. By removing Reservoir and supplying its place with cover plates, a complete six-hole stove is obtained.

The fire-back is in three heavy interchangeable pieces. A water-back is provided which occupies the same space as fire-back, heats perfectly and does not retard the heating of oven, for reasons of the intervening flue between it and oven.

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Its neat design, nicely polished edges, nickeled panel plates and trimmings, give it a very attractive appearance.

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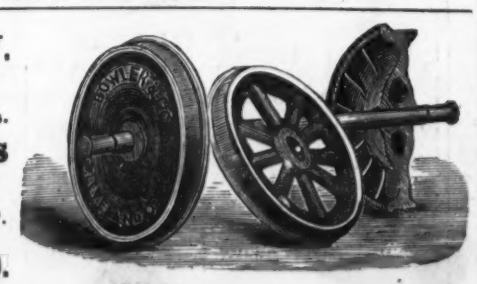
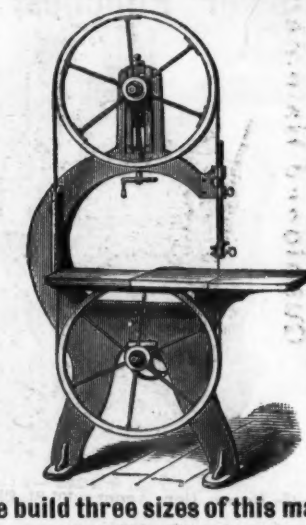


Eureka Band Saw.



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The two smaller sizes will saw hard wood 12 in. thick, the largest 16 in. thick. They are made of the best material and are well made.

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Call at Works and see them in Stock.

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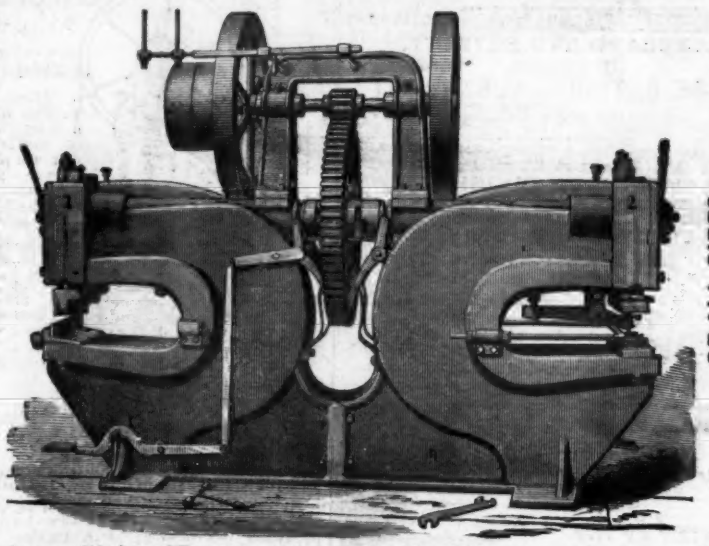

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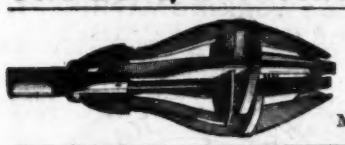

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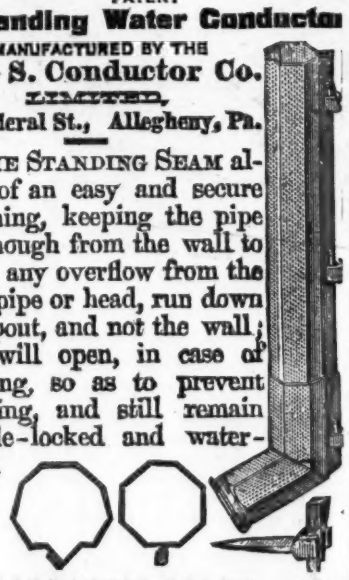

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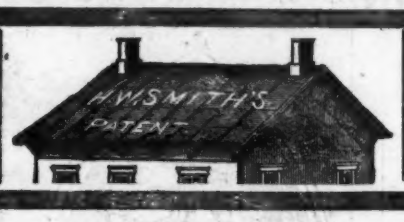

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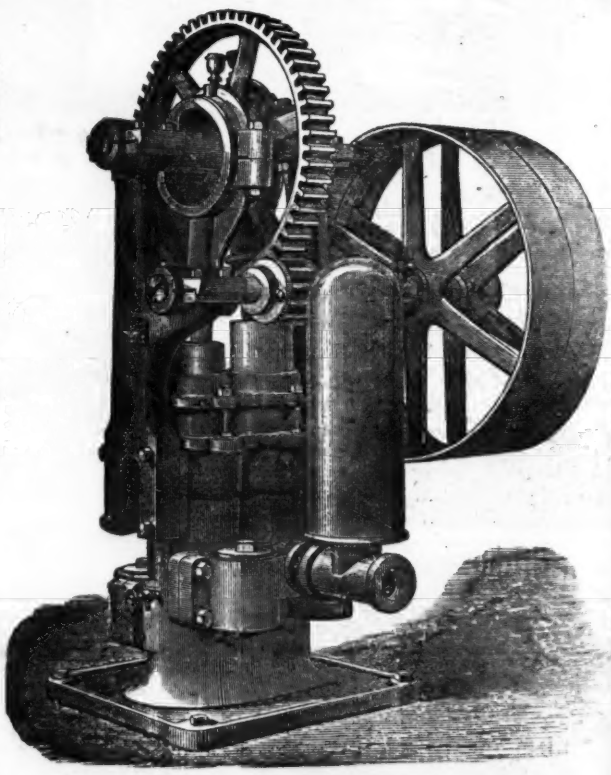

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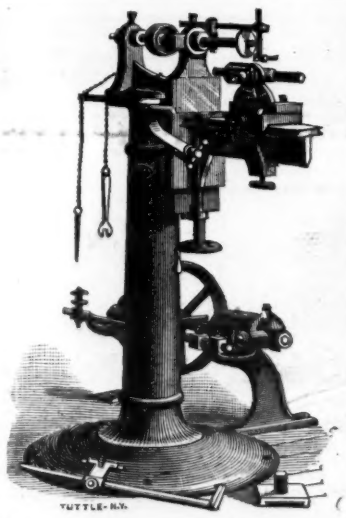

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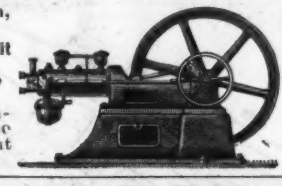

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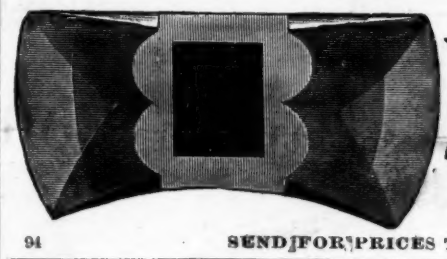

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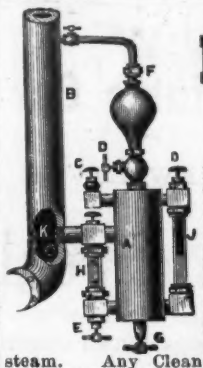

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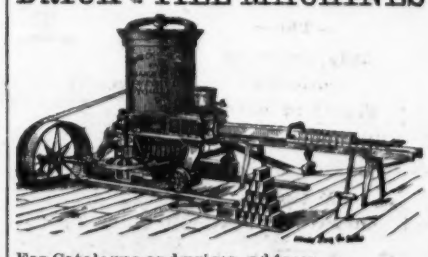

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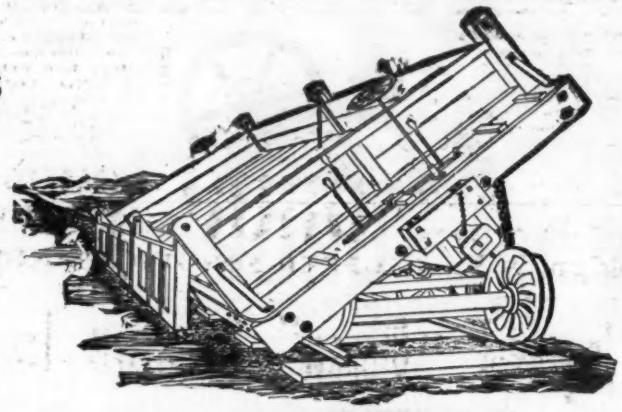

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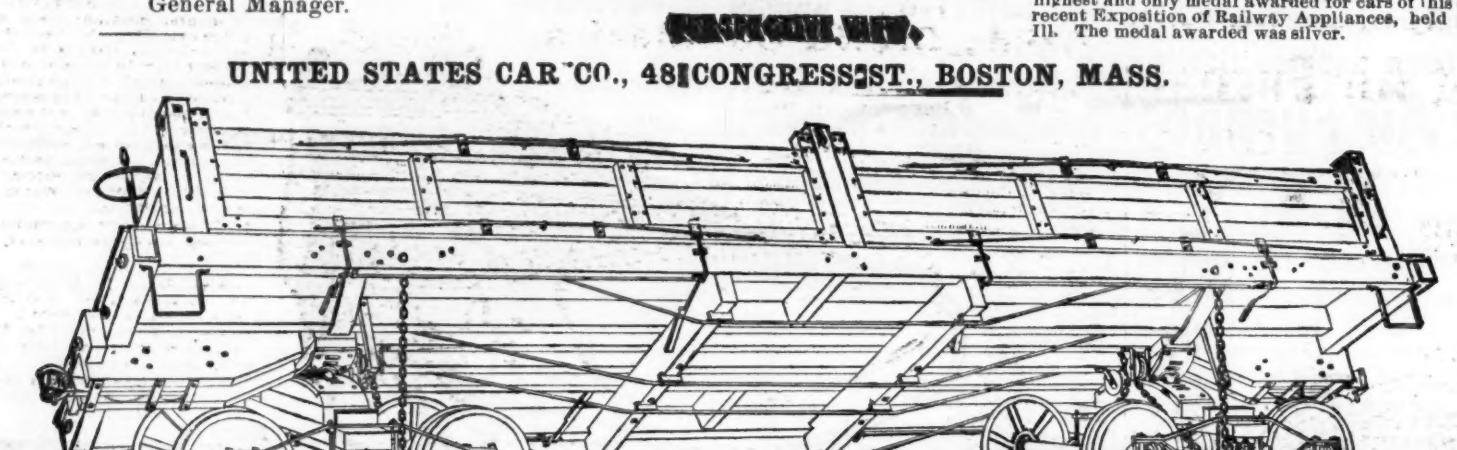

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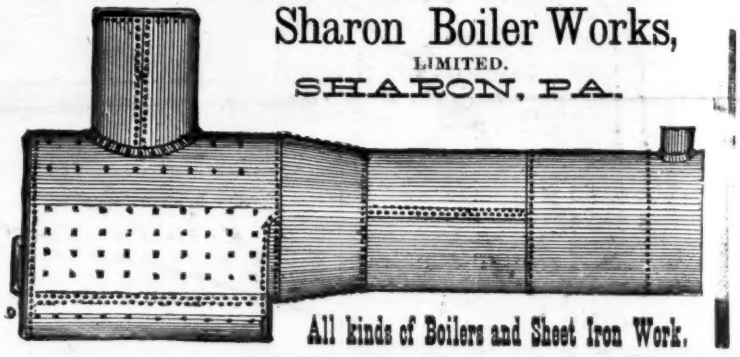

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